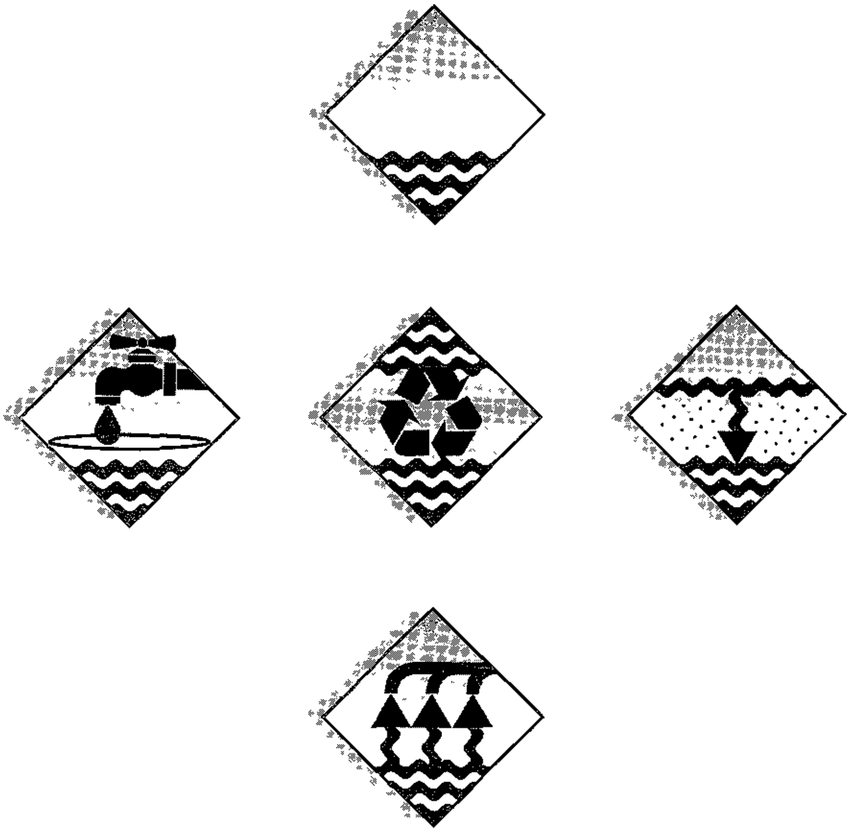
Integrated Water Resources Plan

FINAL REPORT

January 1997



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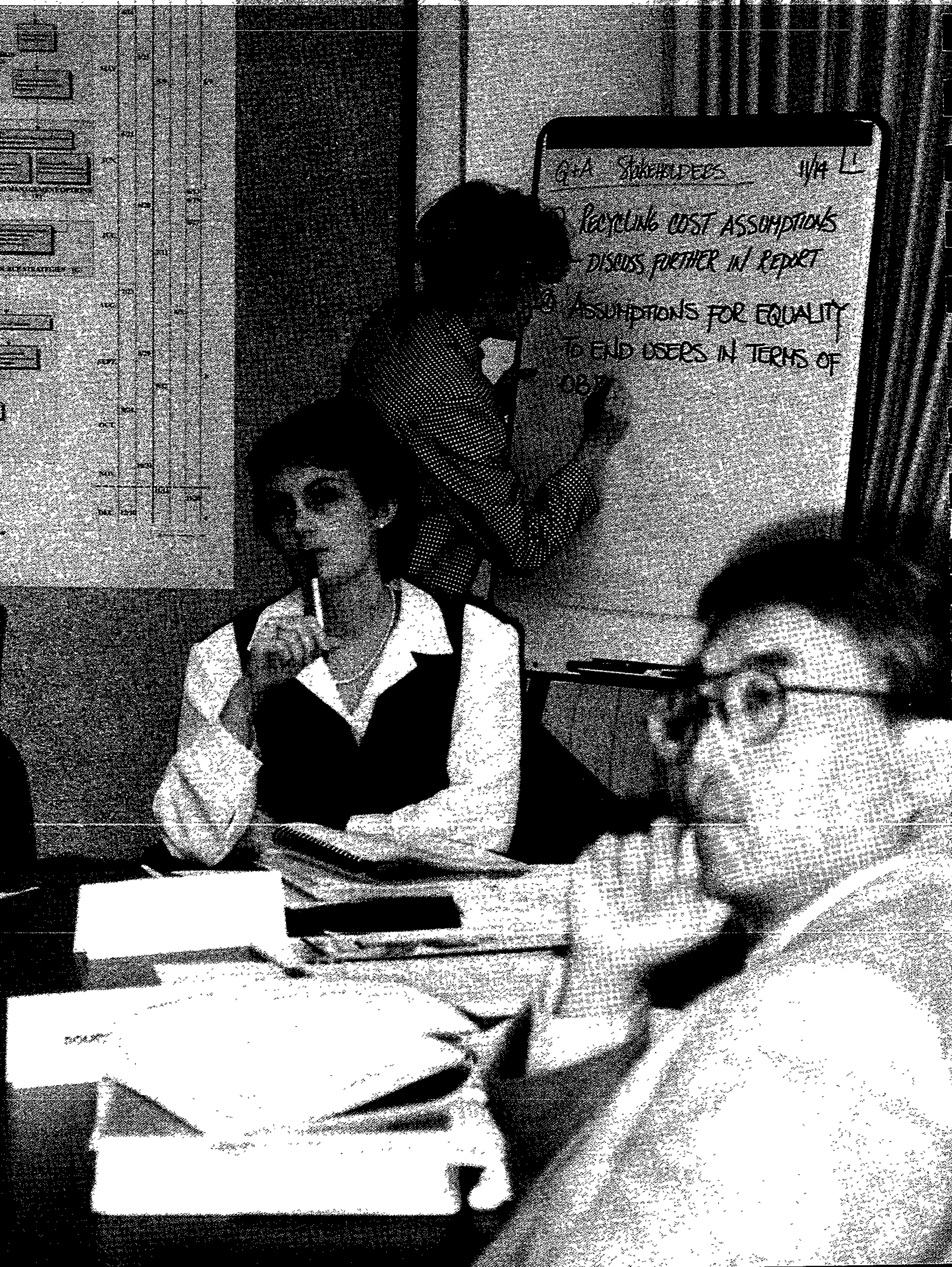
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SANTA CLARA VALLEY WATER DISTRICT

INTEGRATED WATER RESOURCES PLAN

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January 1997

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Larry Wilson	District 4		

On December 10, 1996, the Santa Clara Valley Water District Board of Directors unanimously accepted the preferred strategy contained in this Integrated Water Resources Plan (IWRP) Final Report. The preferred strategy establishes a course of action for the District that is intended to meet future water supply needs through the year 2020, while balancing a variety of objectives.

The preferred strategy was developed using an extensive public involvement, or "stakeholder," process. During the IWRP development phase, a core group of public participants worked closely with District staff to review work and provide feedback. Representatives of this group appeared at the December 10 Board meeting to endorse the preferred strategy and encourage the Board of Directors to accept it.

This report chronicles the District's IWRP planning process and preferred strategy development. It also identifies future work needed to ensure successful implementation of the preferred strategy.

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As the next century approaches, the Santa Clara Valley Water District—and other California water suppliers—are facing the crucial question: Will there be enough water to satisfy future demand?

If Santa Clara County enjoyed only average to wet years from now to the year 2020, current water supplies could probably meet demand—even with projected population growth. However, as the recent 6-year drought showed local communities, dry periods are a fact of life in California. District projections indicate that in future severe droughts the County could experience a water supply shortfall of 100,000 acre-feet—almost a third of current local water use.

To address this potential water supply gap, and to ensure a reliable supply of high-quality water through the year 2020, the District launched the Integrated Water Resources Plan (IWRP) in March 1996. The IWRP project's preferred strategy for meeting future water supply needs was presented to and accepted by the District's Board of Directors on December 10, 1996.

Key term: acre-foot

One acre-foot equals approximately 326,000 gallons, the average annual amount of water used by two families of five.

What Is The IWRP?

Water resource agencies throughout the United States are using integrated water resource planning processes to develop flexible, long-term water supply plans that meet the needs of the agencies and communities they serve. Key elements of IWRP planning are community outreach and involvement and flexibility to respond to changing water supply conditions. District Board members chose the IWRP process as the best way to make short-term decisions and address long-term factors, including uncertainties that could influence Santa Clara County's long-term water supply.

The basic work of the IWRP has been to develop several alternative water resource strategies and rate them against planning objectives *(see "IWRP Elements" on page ES-4)*, with the goal of selecting a final preferred strategy. From March through November 1996, IWRP project staff met regularly with community "stakeholders" for assistance in this work. Stakeholders included the general public and representatives of business, community, environmental and agricultural groups, as well as District technical staff and officials of local municipalities and other water agencies *(see sidebar on page ES-2)*.

To make sure the District Board of Directors was kept abreast of all project developments, IWRP project staff also made scheduled Board presentations throughout the process. Staff presented the draft IWRP report to Board members and the general public in November 1996. The IWRP Final Report, released in January 1997, will serve as a guidance document for future District water supply planning.

The IWRP process is shaped by the premise that a wide array or combination of water resource options could meet the District's desired goals, and that any selected strategy must respond to community concerns in order to succeed.

Why Is The IWRP Needed Now?

As the wholesale water supplier for Santa Clara County, the District historically has been responsible for planning the County's long-term water supply. The District's last comprehensive water supply plan was published in 1975. While many of the 1975 plan's recommendations have been adopted and implemented, events have since taken place that underscore the need for an updated, more flexible water supply planning process. Among those events:

- **A Recent Severe Drought**

During 6 years of sparse local rainfall, from 1987 to 1992, available supplies

In the IWRP process, a stakeholder is any individual who will be affected by or has an interest in the County's long-term water supply. Stakeholders include the general public; community, business and environmental groups; and public officials. Stakeholder involvement is crucial to acceptance of the IWRP plan; therefore, three levels of external stakeholder participation were incorporated into the plan. In addition, internal stakeholders–District staff with technical expertise on water supply issues–periodically reviewed IWRP developments.

Stakeholders

- **Level 1: Core Group**

Made up of 20 representatives from businesses, local cities, other water agencies, agriculture, environmental and community groups, this group was invited by the District to work on the plan throughout the 10-month initial planning phase.

The core group met five times to review IWRP developments, including planning objectives, the screening process, components and resource strategies. Among water supply issues members cited as most important were reliability, quality, cost and efficient use.

In July 1996, Level 1 stakeholders built their own, independent hybrid strategies from those components they felt would be the most successful in meeting potential water supply shortfalls: water conservation (demand management), water transfers, water banking, and non-potable recycling. Staff were able to build on this work in the next level of strategy building, clear in the knowledge that they were using components stakeholders could support. In reviewing staff's work in a September meeting, Level 1 stakeholders again confirmed strategy direction, and helped shape the contingency elements that are linked to the preferred strategy. In November 1996, Level 1 stakeholders endorsed the preferred strategy, predicated upon several concerns that are outlined in Chapters 2, 10 and 11 of the IWRP Final Report. A Level 1 representative also appeared before the Board of Directors on December 10, 1996, to support the preferred strategy.

- **Level 2: Public Forum**

To gain a broader community perspective on IWRP issues, the District held a public forum on August 5, 1996. Participants, who were invited from an extensive list of community, business, environmental, civic and agricultural groups, ranked different water-related issues and evaluated thematic strategies that addressed those issues. Feedback from the Level 2 group was also incorporated into subsequent strategy-building sessions.

- **Level 3: Public Meetings**

To present the IWRP project and engage the public at large in a general discussion of future water supply concerns, the District held three public meetings in June 1996 in the north, central and south parts of the County. Attendees expressed support for the public-oriented IWRP process and identified water recycling, environmental mitigation, local storage and water quality as some key concerns. Participants were offered opportunities to sign up for further participation at the August 5 forum and receive notification of future public meetings on the IWRP process. On November 20 the District held a fourth public meeting, on the Draft IWRP Final Report.

If Santa Clara County enjoyed only average to wet years from now to the year 2020, current water supplies could probably meet demand. But droughts are a fact of life in California. And in future severe droughts the County could experience a water supply shortfall of up to 100,000 acre-feet, according to District projections.

could not meet County water demands. Occasional droughts are to be expected in our semi-arid climate; planning ahead to provide adequate water during such dry periods is essential.

■ Changing State and Federal Environmental Regulations

Most of the District's imported water comes to the County from the Sierra Nevada mountains via the Sacramento/San Joaquin Delta (Delta). This imported water is delivered by the State Water Project (SWP) and the Central Valley Project (CVP), both of which are subject to state and federal environmental regulations that protect water quality and fish and wildlife habitat in the Delta and its upstream watersheds. Deliveries from the Delta are currently restricted under the State Water Resources Control Board's water quality standards and the federal Endangered Species and Central Valley Project Improvement acts. Regulations like these are expected to continue to restrict the District's imported water deliveries in the future.

Our water supply comes from a variety of sources: local, recycled and imported, including water from the City and County of San Francisco's Hetch-Hetchy system.

Water Supply Sources for Santa Clara County

- **Local.** Rainfall and subsequent runoff constitute our local supply, which is either diverted into the District's 10 reservoirs or percolates into the underground basin for storage there. The average yearly surface flow that can be captured and diverted to reservoirs, treatment plants or the groundwater basin is about 101,000 acre-feet per year; natural recharge into the groundwater basin adds another 112,000 acre-feet. During critical dry periods these amounts average only 59,000 acre-feet and 74,000 acre-feet, respectively.
- **Recycled.** Four water pollution control plants within the County develop recycled water for use in outdoor irrigation. The San Jose/Santa Clara plant will shortly produce 9,000 acre-feet per year; Sunnyvale, 2,400 acre-feet; and Gilroy, 2,600 acre feet; Palo Alto currently produces 400 acre-feet; for a combined total of 14,400 acre-feet per year.
- **Imported.** The District has contracts with both the State Water Project (SWP) and the federal Central Valley Project (CVP) for deliveries of imported water. However, deliveries from both systems are restricted due to flow requirements for the protection of water quality, fish and wildlife under state and federal regulations. The SWP contract is for 100,000 acre-feet per year; average yearly delivery is 74,000 acre-feet. This figure drops to 47,000 acre-feet during critical dry periods.

  Under a federal policy that guarantees a minimum amount of water to municipal and industrial users, the District contracts for 152,500 acre-feet per year from the CVP. Average yearly delivery, however, is 125,000 acre-feet; this figure drops to 110,000 acre-feet during critical dry periods.
- **Hetch-Hetchy.** Several communities within Santa Clara County contract directly with the City and County of San Francisco for imported water from the Hetch-Hetchy project in the Sierra Nevada mountains. The District does not control or administer these deliveries, which average about 64,000 acre-feet per year. However, Hetch-Hetchy water reduces demands on District-supplied water.

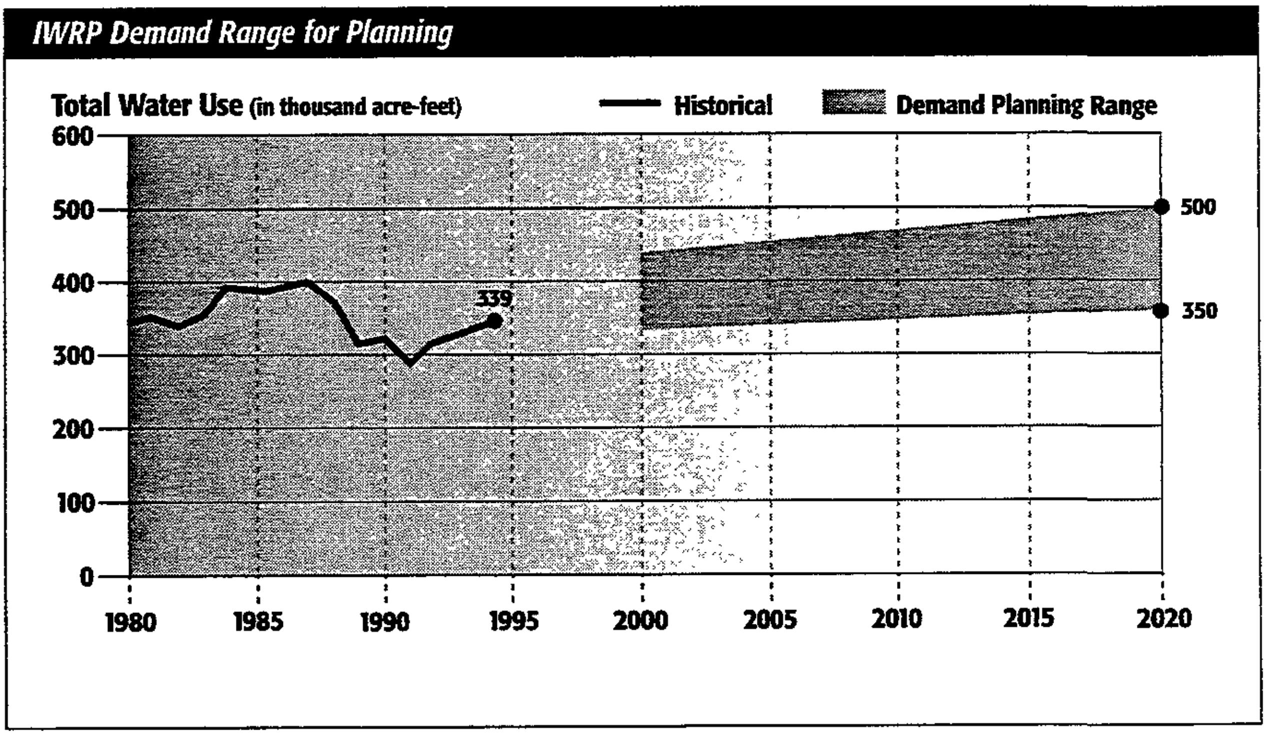
■ Projected Growth

Home to high-tech Silicon Valley, Santa Clara County ranks fourth in the state in terms of population and jobs. Since 1960, the County's population grew from just over 650,000 to more than 1.6 million. According to recent projections from the Association of Bay Area Governments, the County's population could reach almost 1.9 million by 2020; water use is likely to increase accordingly.

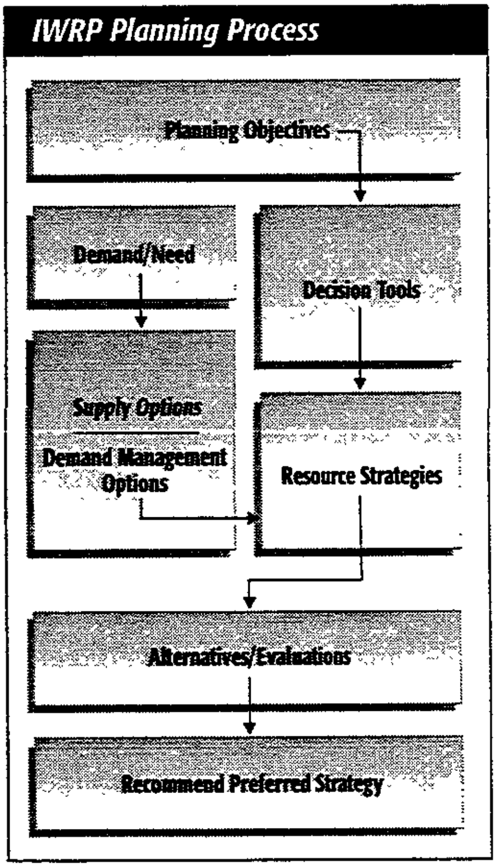
Demand for Water

Many factors that affect water demand are difficult to predict. For example, weather patterns fluctuate, development and growth may vary from projections, and conservation programs may save more or less water than expected. To account for such uncertainties, the IWRP used a ***range*** of demand. This range allows the District to develop flexible water resource strategies that can be refined over time in response to actual conditions.

Shown on page *ES-4*, the demand range accounts for demographic changes and water conservation savings expected in the County through 2020. The range for 2020 is between 350,000 acre-feet at the low end and 500,000 acre-feet at the high end. The lower end of the range is based on 1991 water-use data, which reflect drought and recession-related behaviors. The higher end is based on pre-drought, pre-recession water use records. Strategies developed during the IWRP process were designed to meet high-end demand; the preferred strategy is designed to meet a range of demands up to 500,000 acre-feet.



IWRP Demand Range for Planning



IWRP Planning Process

IWRP Elements

■ Planning Process

The chart at left shows the IWRP's planning process. In March 1996, the District's Board of Directors established **objectives** for staff and stakeholders to use as **decision tools** in evaluating water resource options and strategies. Next, staff identified the County's future water **demand/need**, with the year 2020 as a planning horizon. In June 1996, IWRP participants began studying **supply and demand management options** that could be employed to meet the projected 100,000 acre-foot shortfall. Some of these options, including water conservation, water recycling, surface and groundwater storage, and water transfers and banking, later became components of **resource strategies**. Strategy development began in July 1996 with theme-based strategies (for example, water recycling) and moved on to more complex "hybrid" strategies. **Evaluation** of the hybrids led in turn to development and recommendation of the **preferred strategy** that is outlined in this document.

■ Objectives

Thirteen objectives were originally set by the Board for the evaluation of water resource options and strategies. In July 1996 staff developed two additional objectives. The 15 objectives were grouped into five categories: **Operational** (affecting District operations); **Risk** (affecting the District's ability to provide water); **Economic** (affecting District and community costs); **Community** (affecting the public in economic, recreational, water quality, water use and community acceptance areas); and **Environmental** (affecting habitat or ecosystems in the District's service area).

As IWRP participants continued to work toward the preferred strategy, they decided to focus on six objectives that best differentiated between strategies, as highlighted in the chart on page *ES-5*: **Maximize Effective Use of Water Supply**; **Maximize Ability to Respond to Changing Conditions**; **Minimize Rate Impacts**; **Include Public Involvement and Maximize**

IWRP Objectives	Categories
1. Provide Equal Reliability of Water Throughout the County	Operational
2. Maximize System Flexibility	
3. Maximize Effective Use of Water Supply	
4. Maximize Multi-Purpose Potential for Integrating District Functions	
5. Meet Level of Service	
6. Minimize Risk of Providing Supplies	Risk
7. Maximize Ability to Respond to Changing Conditions	
8. Minimize Total District Costs	Economic
9. Minimize Rate Impacts	
10. Protect Economic Well-Being of County by Minimizing Costs to the Community	Community
11. Include Public Involvement and Maximize Public Acceptance	
12. Maximize Opportunities for Recreation and Environmental Uses	
13. Maximize the Quality and Treatability of Source Water	
14. Promote Efficient Water Use	
15. Avoid or Minimize Adverse Impacts to Habitat or Ecosystems	Environmental

Public Acceptance; **Maximize the Quality and Treatability of Source Water**; and **Avoid or Minimize Adverse Impacts to Habitat or Ecosystems**. The preferred strategy was evaluated against all 15 planning objectives to ensure that it met all criteria.

In evaluating resource strategies, all objectives were given the same weight; for example, maximizing water quality was assumed to be of the same importance as minimizing rate impacts and minimizing impacts to habitat.

■ Supply and Demand Management Options

One of the first tasks of the IWRP project was to identify water supply options that could be used to build strategies to meet the projected shortfall. These options fell into two categories: those that augment supply, such as a new reservoir; and those that reduce demand, such as water conservation (demand management) measures.

Thirteen options were chosen as the "most promising" structural elements for the IWRP's first round of strategy building, discussed below. Another 12 options were held for future consideration, should any of them show additional merit in the future. For a complete discussion of the supply and demand management options, see Chapters 6 and 7 of the IWRP Final Report.

■ Resource Strategies

To fully explore whether any one approach could adequately meet future water supply needs, IWRP participants initially focused on building and screening "thematic" or single-focus strategies. In the second round of strategy building, IWRP participants developed integrated or "hybrid" strategies. These strategies incorporated elements from the thematic group to provide a more balanced solution to future water supply needs.

Yield vs. Storage Capacity

Yield refers to the amount of water that a facility (such as a reservoir, groundwater basin or water bank) can supply in a specific time interval, usually a year. Storage capacity refers to the quantity of water that can be stored in a facility–not to the yearly amount the facility can produce. During a multiple-year drought, annual yield can be significantly less than storage capacity, since storage is depleted over several years.

Thematic (Component-Based) Strategies

From the most promising supply and demand management options, District staff selected components for construction of the eight thematic strategies, which are detailed below. Staff also provided initial assessments of each strategy for stakeholder review.

- **Baseline**

This strategy would implement all core elements, but offers no additional water supply options. Staff assessment: Low cost, moderate environmental impacts, could result in severe shortages in drier years.

- **Demand Management** (aggressive water conservation program)

In addition to core elements, this strategy assumes additional water savings of approximately 35,000 acre-feet from voluntary and mandatory conservation programs (this figure includes 9,500 acre-feet of savings from graywater systems; the graywater element was eventually dropped due to public health and environmental concerns). Staff assessment: Public acceptance uncertain; could result in severe shortages in dry years.

- **Water Recycling**

In addition to core elements, this strategy calls for about 37,000 acre-feet of non-potable (non-drinkable) and 60,000 acre-feet of indirect potable (highly treated for drinking) recycled water per year; the indirect potable water would be blended in existing reservoirs and sent through treatment plants for delivery. Staff assessment: Would likely meet water demands in all years; could have high implementation cost. Environmental impacts due to brine disposal from treatment process for indirect potable. Public acceptance uncertain.

- **Maximize Local Storage**

In addition to core elements, this strategy would include construction of a new South County treatment plant and additional expansion of the Rinconada Water Treatment Plant. It would prioritize use of imported water in average and wet years, and store surface and groundwater for use in drier years. Staff assessment: Could improve South County water quality. Severe shortages could occur in dry years. Moderate cost impact; minimal environmental impact; public acceptance probable.

- **New Reservoir**

In addition to core elements, this strategy would store imported water in a new, 550,000 acre-foot reservoir (location undetermined). Staff assessment: Moderately high implementation cost; potential difficulty in obtaining construction permits. Significant environmental impact; could result in new recreational opportunities. Public acceptance uncertain.

- **Water Banking**

In addition to core elements, this strategy would store 550,000 acre-feet of excess District wet-year supplies out-of-County for use in dry years. Staff assessment: Could result in some shortages in early years; low implementation cost; minimal environmental impact; probable public acceptance.

- **Long-Term Transfers**

In addition to core elements, this strategy would purchase 100,000 acre-feet of imported water from outside the County for use in dry years. Staff assessment: Shortages unlikely; however, locating such a large amount of water in dry years could be difficult. Moderate cost. Minimal environmental impact; possible third-party impact. Public acceptance likely.

IWRP Core Elements

Each strategy developed during the IWRP process incorporates identical core elements, which consist of work already planned by the District to address water supply issues. These elements help the District: ensure the validity of baseline assumptions, monitor and evaluate resource options, and meet IWRP objectives. They include:

- Achieve 46,000 acre-feet of yearly water conservation
- Continue to achieve 14,400 acre-feet per year of non-potable (non-drinkable) recycled water
- Establish Municipal & Industrial shortage policy for CVP supplies
- Protect existing resources and monitor potential impacts
- Protect and improve reliability of SWP, CVP and Hetch-Hetchy supplies
- Implement programs to improve source water quality, treatment capabilities
- Improve data collection and evaluation
- Expand and upgrade Rinconada Treatment Plant
- Add recharge and/or treatment capacity for South County
- Investigate future water marketing and storage opportunities
- Investigate increased recycling opportunities and distribution of costs and benefits for recycled water
- Assess system vulnerability
- Continue community interaction and outreach on water supply issues
- Investigate system re-operation to improve efficiency

See Chapter 8 of the IWRP Final Report for the complete list of core elements.

- **Short-Term Transfers**

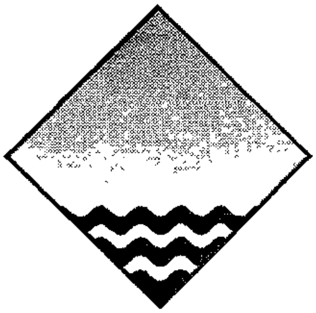
In addition to core elements, this strategy would purchase additional imported water on an as-needed basis during dry years. Staff assessment: Could result in some shortages; anticipated mandatory conservation of 15 percent likely. Low cost; minimal environmental impact; public acceptance likely.

Key Components

In the next round of strategy building, the most successful components from the eight thematic strategies were used to develop hybrid strategies. These components became the final structural elements for hybrid and preferred strategy building.

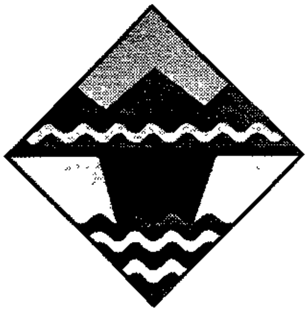
Components are water supply or demand management options that, used together, create water supply strategies to meet the projected future shortfall. The preferred strategy is that water supply strategy which best satisfies the greatest number of planning objectives.

IWRP Key Components



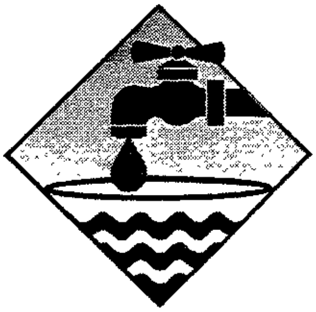
Baseline

No additional water supplies; includes core elements.



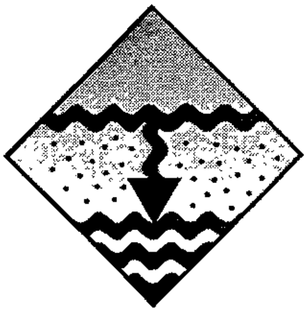
New Reservoir

Optimum capacity for a new reservoir (either in-County or out-of-County) would be about 350,000 acre-feet to meet future shortfalls.



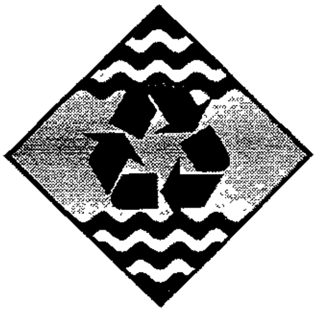
Demand Management

Program 1 (core elements plus 11,000 acre-feet): Existing conservation program plus plumbing code changes; low-flow dishwasher retrofit program; would require water-efficient landscapes for new residential construction. **Program 2** (core elements plus 25,200 acre-feet): Includes Program 1 plus point-of-use water heaters, developer demand offsets.



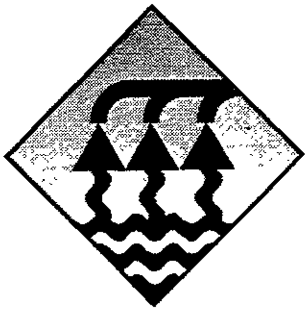
Water Banking

Would store excess District water during average and wet years in an out-of-County groundwater basin for use during dry years. The District is already engaged in such an agreement with Semitropic Water Storage District in Kern County for storage of up to 45,000 acre-feet for withdrawal through 2035.



Water Recycling

Non-potable projects either completed or under construction are expected to produce more than 14,400 acre-feet per year. The District estimates that an additional 32,000 acre-feet could be developed to add new supplies. Indirect potable recycling would include advanced treatment and subsequent blending in Anderson Reservoir for groundwater recharge or delivery to a District treatment plant. About 60,000 acre-feet per year could be integrated into the current system.



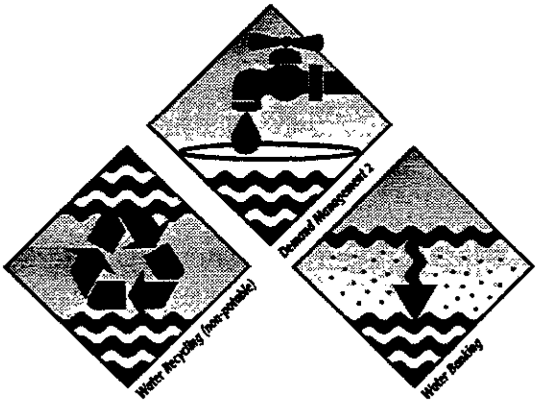
Long-Term Water Transfers

Would purchase additional water to supplement existing imported water contract supplies. Could involve either the purchase of a contract entitlement or right, which would provide the same amount of water every year, or the purchase of an option to take water only when needed.

Hybrid Strategies

Evaluation of the thematic strategies revealed that no single approach could adequately meet future water demand. In the second round of strategy building, improved or hybrid strategies were created from key components to achieve a more balanced approach to solve potential water supply shortfalls. Using screening data from IWRP participants, District staff created the following four hybrid strategies for stakeholder review.

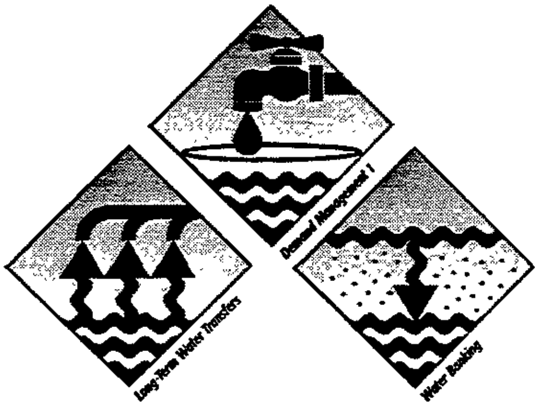
Hybrid Strategy 1: Minimize Environmental Impacts



This strategy relies on components that have the least potential for negative environmental impacts.

- **Demand Management** (25,200 acre-feet). Program 2.
- **Non-Potable Recycling** (32,300 acre-feet). Assumes implementation of non-potable recycled water for urban and agricultural irrigation and industrial reuse.
- **Water Banking** (up to 350,000 acre-feet). Assumes implementation of a program in which excess District water would be stored in an out-of-County groundwater basin during average and wet years, to be transferred back during dry years.

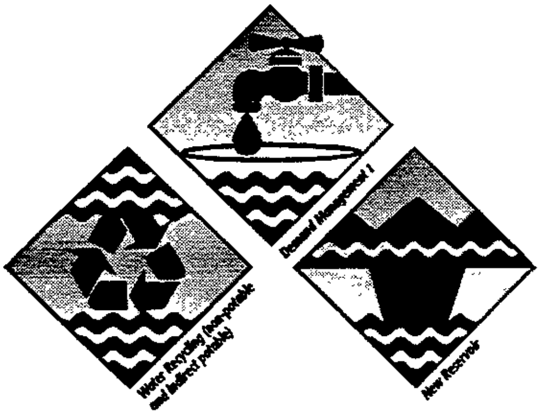
Hybrid Strategy 2: Maximize Flexibility To Meet Changing Demands



This strategy aims to optimize the District's flexibility to meet actual water demands, whether they exceed or fall short of projections.

- **Demand Management** (11,000 acre-feet). Program 1.
- **Long-Term Transfers** (60,000 acre-feet). Assumes District contract with another party to buy additional imported water during dry periods.
- **Water Banking** (up to 350,000 acre-feet).

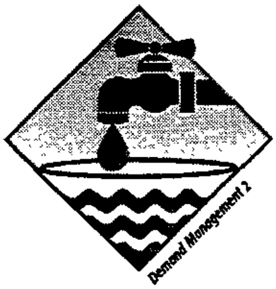
Hybrid Strategy 3: Maximize Local Reliability


Demand Management 1
Water Recycling (non-potable and indirect potable)
New Reservoir

The objective of this strategy is to maximize local water supply reliability by developing more water and storing it either in a local, District-built reservoir or in an out-of-County reservoir with the District as one of several participants.

- **Demand Management** (11,000 acre-feet). Program 1.
- **Non-Potable Recycling** (6,000 acre-feet). Assumes only infill for existing South Bay Recycling and Gilroy/Morgan Hill recycling programs.
- **Indirect Potable Recycling** (35,000 acre-feet). Would blend highly treated recycled water in Anderson Reservoir for subsequent treatment and delivery or groundwater recharge. This would occur only during dry periods.
- **New Reservoir** (up to 350,000 acre-feet). Assumes construction of a new reservoir to store imported water. Could be a joint venture with other agencies out-of-County or a single or joint venture by the District in Santa Clara County.

Hybrid Strategy 4: Minimize Costs



This strategy aims to use components that will result in low costs to the community.

- **Demand Management** (25,200 acre-feet) Program 2.
- **Long-Term Transfers** (75,000 acre-feet).

The Preferred Strategy: Flexibility to Respond to Future Uncertainties

The next step in the IWRP process was to build a new strategy from those elements that ranked best in the hybrids evaluation for meeting a 100,000 acre-foot shortfall by 2020: water banking, non-potable recycling, demand management, and long-term transfers. This ***preferred*** strategy was based on input from Level 1 Stakeholders and staff, who generally ranked hybrid strategy 2 (Maximize Flexibility to Meet Changing Demands) higher than the other three hybrid strategies against the six objectives. To improve hybrid strategy 2 further, staff built in increased use of recycled water and water banking.

The five basic elements of the preferred strategy are:

■ **Core Elements** *(baseline supplies)*

■ **Water Banking** *(up to 350,000 acre-feet).* Would secure groundwater bank for imported water received by the District in wet and average years. Timeline: Recommend working to secure banking agreements immediately. Cost per acre-foot in 1996 dollars: $322.

■ **Recycled Water** *(at least 6,000 acre-feet, and up to 31,000 acre-feet, contingent upon potential partnerships with wastewater treatment agencies in the County).* Would expand existing South Bay and Gilroy/Morgan Hill non-potable recycling programs; also calls for pursuing potential cooperative recycling programs with wastewater agencies. Timeline: Recommend planning this project immediately. Cost per acre-foot in 1996 dollars: $1,350.

■ **Demand Management** *(water conservation).* ***Program 1*** *(11,000 acre-feet).* Timeline: Recommend beginning implementation in 2002, after regulations governing the District's current conservation program come to an end. Cost per acre-foot in 1996 dollars: $300.

■ **Long-Term Transfers** *(up to 50,000 acre-feet).* If demands are anticipated to reach the upper end of the demand range, the District could consider additional long-term transfers of up to 25,000 acre-feet per year. Water recycling could also substitute for this amount if cost and operations issues are resolved. Timeline: Recommend having agreement for up to 25,000 acre-feet in place by 2005-2010. Opportunities for transfers that occur earlier than 2005 should be considered as they arise. Cost per acre-foot in 1996 dollars: $116. (This figure does not reflect potential third-party costs that are outside District control).

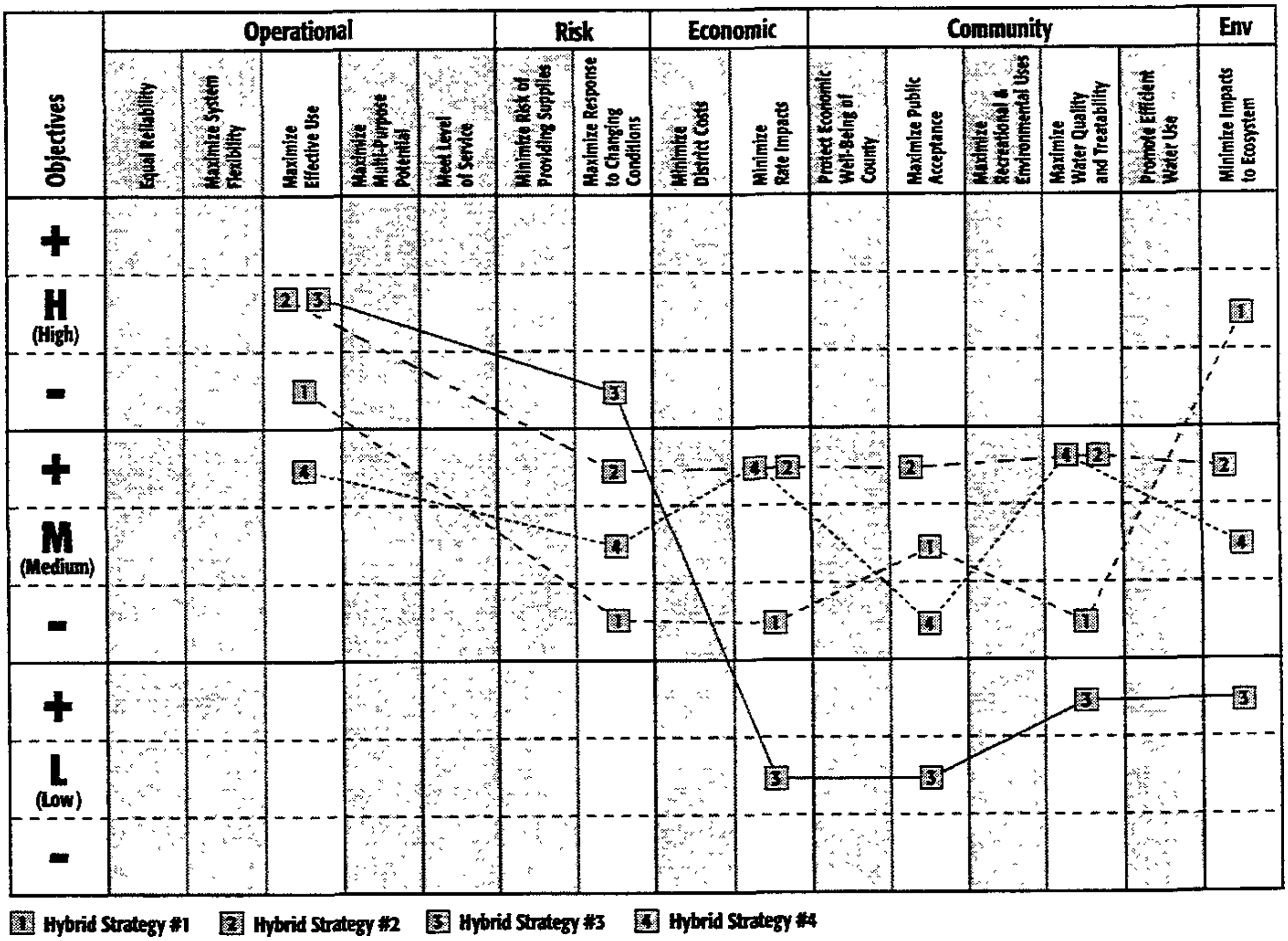
For a detailed cost analysis of the IWRP preferred strategy components, see Chapter 9 and Appendix H of the IWRP Final Report.

Phasing

Components of the preferred strategy would be phased in gradually, as shown in the chart on page *ES-12*. Generally, phasing would be based on demand, which would be monitored along with supplies every 3 to 5 years in an ongoing IWRP process.

- **Minimum Action**—*no shortage (corresponds to 400,000 acre-foot demand):* Should the core elements alone meet demand, no other elements of the strategy would be implemented, pending further monitoring of demand and supplies.
- **Intermediate Action**—*50,000 acre-foot shortage (corresponds to 450,000 acre-foot demand):* In this scenario, both the banking and water recycling programs would be initiated by 2000, with Demand Management Program 1

Evaluation of the Hybrid Strategies



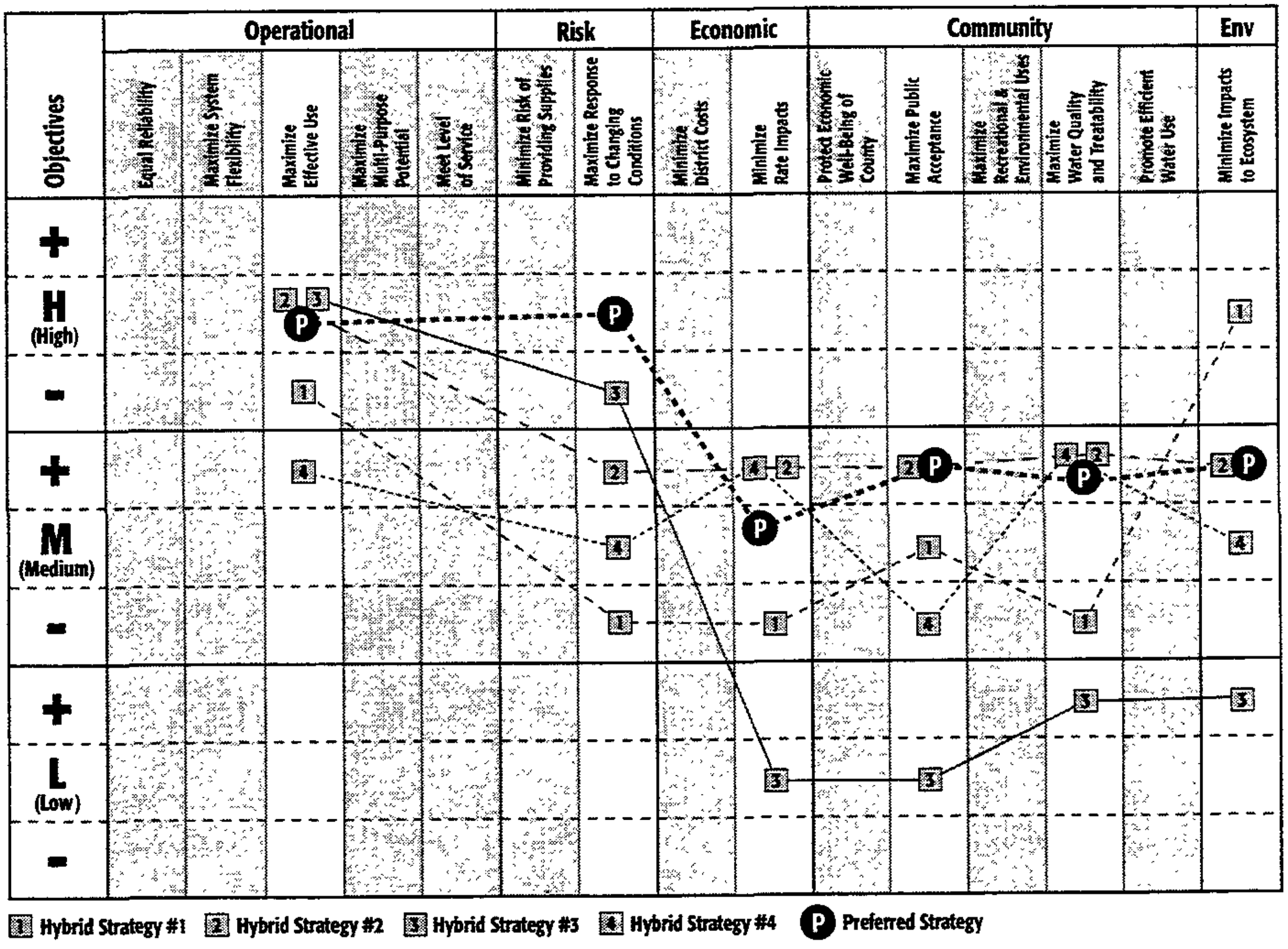
This chart shows how District staff evaluated the four hybrid strategies against the six primary objectives. High-plus represents the best performance against a given objective; low-minus represents the least satisfactory. Stakeholder comments are reflected in the rankings.

following within the next 5 years. Long-term transfers or additional water recycling would begin to be implemented between 2005 and 2010, should demand warrant. Pursuant to Board acceptance in December 1996 of staff recommendations, the District plans to proceed immediately with the Intermediate Action to the year 2000, then update as necessary.

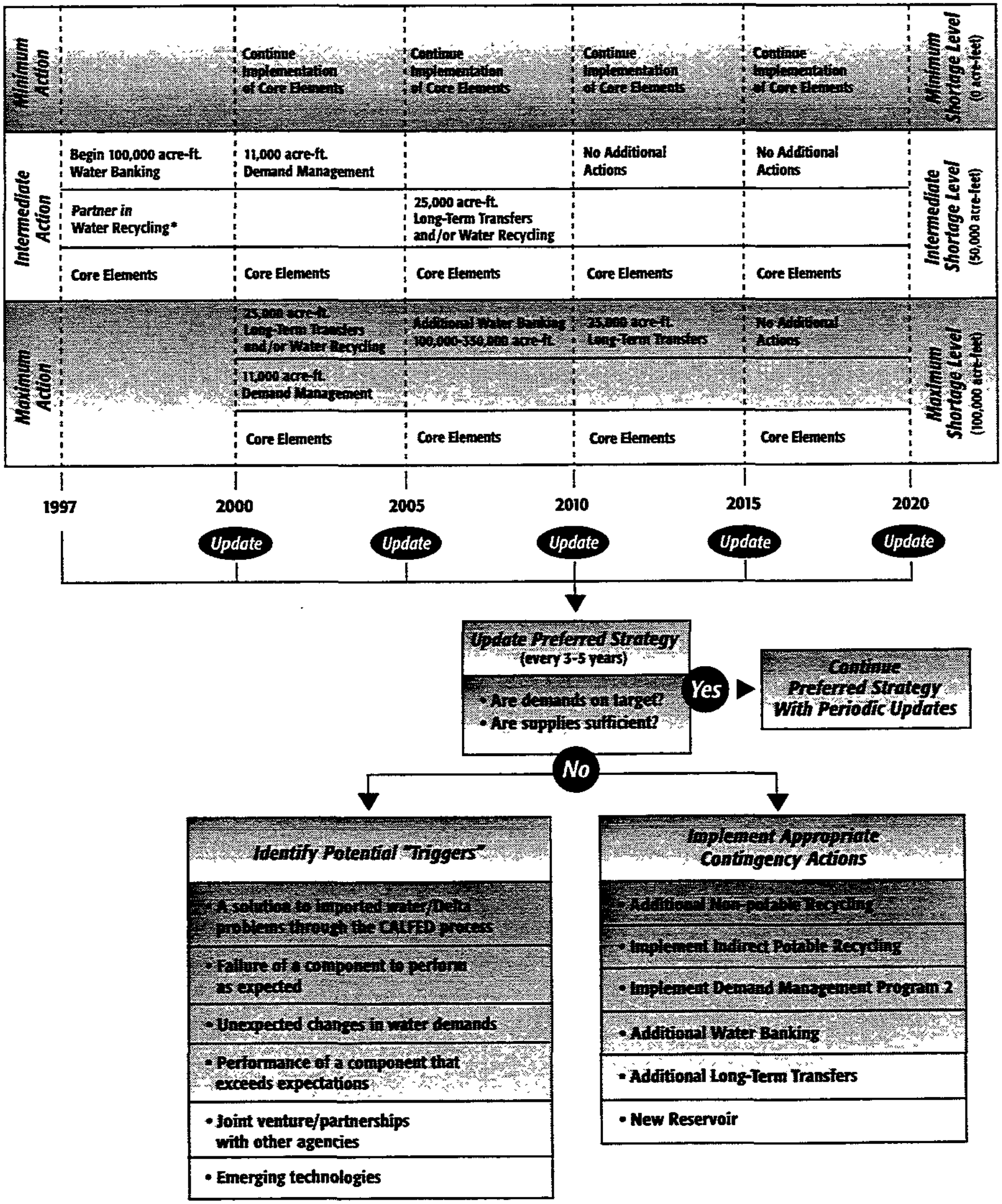
- **Maximum Action**—*100,000 acre-foot shortage (corresponds to 500,000 acre-foot demand):* To meet a major shortage, the long-term transfers would begin to be implemented closer to 2005, with an additional banking program coming on line by 2010. A second transfer program of up to 25,000 acre-feet would be implemented, if needed, by 2015.

> ***Pursuant to Board acceptance in December 1996 of staff recommendations, the District plans to proceed immediately with the Intermediate Action to the year 2000, then update as necessary.***

Evaluation of the Preferred Strategy



IWRP Preferred Strategy and Contingency Actions



	1997	2000	2005	2010	2015	2020
Minimum Action		Continue Implementation of Core Elements	Continue Implementation of Core Elements	Continue Implementation of Core Elements	Continue Implementation of Core Elements	*Minimum Shortage Level* (0 acre-feet)
Intermediate Action	Begin 100,000 acre-ft. Water Banking	11,000 acre-ft. Demand Management		No Additional Actions	No Additional Actions	*Intermediate Shortage Level* (50,000 acre-feet)
	Partner in Water Recycling*		25,000 acre-ft. Long-Term Transfers and/or Water Recycling			
	Core Elements	Core Elements	Core Elements	Core Elements	Core Elements	
Maximum Action		25,000 acre-ft. Long-Term Transfers and/or Water Recycling	Additional Water Banking 100,000-350,000 acre-ft.	25,000 acre-ft. Long-Term Transfers	No Additional Actions	*Maximum Shortage Level* (100,000 acre-feet)
		11,000 acre-ft. Demand Management				
		Core Elements	Core Elements	Core Elements	Core Elements	

Update
Update
Update
Update
Update
Update Preferred Strategy
(every 3-5 years)
• Are demands on target?
• Are supplies sufficient?
Yes
Continue Preferred Strategy With Periodic Updates
No
Identify Potential "Triggers"
• A solution to imported water/Delta problems through the CALFED process
• Failure of a component to perform as expected
• Unexpected changes in water demands
• Performance of a component that exceeds expectations
• Joint venture/partnerships with other agencies
• Emerging technologies
Implement Appropriate Contingency Actions
• Additional Non-potable Recycling
• Implement Indirect Potable Recycling
• Implement Demand Management Program 2
• Additional Water Banking
• Additional Long-Term Transfers
• New Reservoir

*Minimum of 6,000 acre-ft from infill; additional recycling potential to be pursued jointly with wastewater agencies.

Contingency Actions

Recognizing the need to maximize preferred strategy flexibility by keeping additional options open, District staff also developed a contingency plan of action. This plan will be impemented should water demands exceed or fall short of those anticipated by the IWRP.

Contingency actions would be activated by "trigger" events that may have a significant impact either on baseline conditions or on the District's ability to implement the preferred strategy. These events would require either a reevaluation of the IWRP or adjustments to the preferred strategy. Potential triggers include, but are not limited to, the following:

- **A solution to imported water/Delta problems through the joint state/federal CALFED Bay-Delta program**
- **Failure of a component to perform as expected**
- **Unexpected changes in water demands (outside the demand range)**
- **Performance of a component that exceeds expectations**
- **Joint ventures/partnerships with other agencies**
- **Emerging technologies**

Contingency action components identified by staff and stakeholders in the IWRP process are:

- **Demand Management Program 2**. Could be used to supplement the preferred strategy should water demands increase beyond projections or if one or more components fail to perform as expected. Implementation timeline: 5 to 10 years; constant baseline evaluation required.
- **Additional Non-Potable Recycling**. Could be used to supplement the preferred strategy should baseline conditions change, demand management fail to meet expected targets, or if joint ventures were identified. Implementation timeline: 5 to 10 years; constant baseline evaluation, additional dialogue with wastewater agencies required.
- **Indirect Potable Recycling**. Could be used to supplement demand or supply components of the preferred strategy; requires further investigation concerning feasibility. Implementation timeline: 8 to 12 years.
- **Additional Water Banking**. Could be used to supplement the preferred strategy in response to unexpected changes in water demands or institutional changes due to the state/federal CALFED process. Implementation timeline: 5 years.
- **Additional Surface Storage**. Could be used to supplement the preferred strategy in response to unexpected changes in water demands, if another component fails to perform, or if other events arise that would require reevaluation of the IWRP process. Implementation timeline: 15 to 30 years; monitoring of baseline, investigation of feasibility required.
- **Additional Long-Term Transfers**. Could be used to supplement the preferred strategy in response to unexpected changes in water demands or institutional changes due to the state/federal CALFED process. Implementation timeline: 1 to 5 years.

Contingency actions would be activated by "trigger" events that may have a significant impact either on baseline conditions or on the District's ability to implement the preferred strategy.

What's Ahead

With Board acceptance of the IWRP preferred strategy in December 1996, the IWRP began its next phase, a short-term implementation plan. Flexibility remains a key element: The plan includes periodic re-examination of the preferred strategy every 3 to 5 years. This will enable the District to modify the IWRP from time to time to respond to changing climatic, regulatory, economic, demographic or technological developments.

Implementation actions will include:

- Activities to ensure the validity of baseline conditions
- A budget and schedule for implementation of individual preferred strategy components
- Work to ensure the availability of preferred strategy contingency components
- Environmental documentation required to implement the preferred strategy
- Resource option monitoring and evaluation
- Activities to meet IWRP objectives
- Public outreach and participation plan expansion

If it becomes apparent that implementation of any preferred strategy component may result in an impact to the environment, the District will prepare a program-level, project-level, or combination project- and program-level Environmental Impact Report (EIR) as required by the California Environmental Quality Act (CEQA).

As the ongoing IWRP process unfolds in the future, the District will continue to reach out to the community for public input. And stakeholders have indicated a strong desire to continue their participation as the preferred strategy is updated. Public involvement in the IWRP has proven both exciting and invaluable for the District, and has opened the way for further community-oriented planning processes in other District projects. Ultimately, the IWRP process delivered what both the District and the public at large hoped for: a workable, flexible plan to meet potential water supply shortfalls while reflecting community priorities.

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Chapter 1
INTRODUCTION

This chapter explains the history, scope, and purpose of the Integrated Water Resources Plan (IWRP). As a foundation for understanding the water supply issues discussed in this report, the chapter also briefly describes the District's current water resources and facilities. Unfamiliar acronyms, abbreviations, and terms are defined in the glossary to this report, Appendix A.

Integrated Water Resources Planning: An Overview

Utilities and resource agencies throughout the United States are using an integrated resources planning process to develop flexible, long-term plans that meet the needs of the agencies and communities they serve. Key elements of integrated resources planning are community outreach and involvement, and flexibility to respond to changing conditions.

The IWRP process put public participation at the center of water supply planning and represented a new approach for the District. The process was shaped by the premise that a wide array or combination of water resource options could meet the District's desired goals, and that any selected strategy must respond to community concerns in order to succeed.

In 1994 the District's Board of Directors (Board) identified water supply reliability as the top priority issue for the District and an IWRP as the process for achieving it. IWRP work/study sessions were held throughout 1995 with the Board. During these sessions the Board developed planning objectives which served as the foundation of the IWRP project.

The basic work of the IWRP has been to design several water resource strategies and rate them against these planning objectives, with the goal of developing a preferred strategy. (See Table 1-1.) During 1996, IWRP project staff met regularly with community "stakeholders" for assistance in this effort. Stakeholders included the general public and representatives of local municipalities; other water agencies; business, community, environmental, and agricultural groups; and District technical staff. A core group of stakeholders representing a variety of interests met with the District bi-monthly beginning in March 1996, and played an active role in shaping the IWRP process.

The project team kept the public informed of the IWRP process through workshops, newsletters, and media announcements, and made scheduled presentations to the Board throughout the process. Staff presented a draft IWRP report to the general public and the Board in November 1996. On December 10, 1996, the Board accepted the project team's preferred strategy, as well as conclusions and recommendations for further action.

In 1997 a short-term (3- to 5-year) Implementation Plan including activities, schedule, and budget, will be prepared which will 1) identify future areas of study necessary to complete the implementation of the selected resource strategy, and 2) address the development of contingency plans. Because this final IWRP report does not contain *recommendations for specific actions*, an Environmental Impact Report (EIR) is not currently necessary. However, when recommendations become more defined, a decision will be made to proceed with further program-level or project-level studies and environmental review as necessary to comply with the California Environmental Quality Act (CEQA).

TABLE 1-1
Key IWRP Developments

March 1996: Planning Objectives	The project team introduced the Board's planning objectives for the evaluation of water supply strategies; these objectives were refined by stakeholders.
May 1996: Project Need and Water Supply Options	The team explained the range of water supply shortfalls that could occur through year 2020 and presented an array of potential options for meeting these shortfalls. Options included those that augment supply (such as a new reservoir); and those that reduce demand (such as water conservation).
July 1996: Thematic Water Resource Strategies	The options were evaluated according to key planning objectives. The most promising options were used as primary components of eight "thematic" water resource strategies, each based on a single theme. The thematic strategies were evaluated to identify which best satisfied the greatest number of planning objectives.
September 1996: Hybrid Water Resource Strategies	Four "hybrid" water resource strategies were developed based on the most successful components derived through the evaluation of the thematic strategies. The hybrid strategies were evaluated in a similar objective-based process.
November 1996: The Preferred Strategy	The most successful components of the hybrid strategies were combined into a preferred water resource strategy for consideration by stakeholders and the Board.
December 1996: Board Acceptance	The Board accepted the preferred strategy.

Project Need and Potential Shortages

The District's last comprehensive water supply plan was completed in 1975. Most of the 1975 plan's recommendations have been implemented, including the San Felipe Division of the Central Valley Project (CVP) and major additions and improvements to the District's distribution and treatment systems. However, many recent events underscore the need for an updated water supply planning process. Federal and state environmental requirements have changed dramatically, water quality standards have grown more stringent, the public's expectations of the District have changed, and two severe droughts have altered our understanding of water supply availability. These factors now challenge the District's ability to meet the long-term water supply needs of the County.

District projections indicate that in future severe droughts Santa Clara County could experience significant water supply shortfalls—as much as 100,000 acre-feet (af) by year 2020.

If the County enjoyed only average to wet years, current water supplies could probably meet demand through the year 2020, even with projected population growth. However, as the recent 6-year drought demonstrated to local communities, dry periods are a fact of life in California. District projections indicate that in future severe droughts, Santa Clara County could experience significant water supply shortfalls—as much as 100,000 af by the year 2020.

The water supply solutions developed through the IWRP process are intended to carry the County through the year 2020. These solutions are designed to meet shortfalls that could result from a range of possible water demand scenarios.

The District's Water Supply System

Santa Clara County's water supply comes from a variety of local and imported sources. These sources, and the amount of water available from them during wet, long-term average, and critical dry period conditions are shown in Table 1-2. District facilities to store, treat, and distribute these supplies are described below and shown in map format in Figure 1-1.

TABLE 1-2
Santa Clara County Water Supply (average values for the hydrological period in af/year)

		Wet[1]	Long-Term Average[2]	Critical Dry Period[3]
Local Supplies	Surface Water Yield[4]	155,000	101,000	59,000
	Natural Groundwater Recharge	225,000	112,000	74,000
	Recycled Water	14,400	14,400	14,400
	Drawn out of Local Storage	0	0	40,000
Imported Supplies	State Water Project	100,000	74,000	47,000
	Central Valley Project with M&I Preference	152,500	125,000	110,000
	Hetch-Hetchy	76,000	63,800[5]	52,900[5]
Total		**722,900**	**490,200**	**397,300**

[1] Defined as the maximum beneficial supply available during the historic hydrologic record, equivalent to that experienced in 1982.
[2] Defined as the average supply available over the historic record of 1922-1990.
[3] Defined as the most severe dry period during the historic record, the 1927-1934 dry period.
[4] Includes Stanford and San Jose Water Company supplies.
[5] Estimate based on historical usage.

Local Reservoirs

The District operates and maintains a Countywide conservation and distribution system to convey raw water for recharge and treatment. Included are ten local reservoirs which conserve local runoff for either recharge into the groundwater basin or treatment at one of the District's three water treatment plants. The total storage capacity of these reservoirs is 170,000 af. Table 1-3 lists their significant features.

Groundwater Basin

The Santa Clara Valley Groundwater Basin provides about half of the County's water supply for potable use. The basin is divided into three interconnected subbasins.

The Santa Clara Valley Subbasin extends from Coyote Narrows at Metcalf Road to the County's northern boundary.

It is bounded on the west by the Santa Cruz mountains and on the east by the Diablo Range; these two ranges converge at the Coyote Narrows to form the southern limit of the subbasin. The subbasin is 22 miles long and 15 miles wide, with a surface area of 225 square miles. A confined zone within the northern areas of the subbasin is overlaid with a thick clay layer. The southern area is the unconfined zone, or forebay, where the clay layer does not extend. District staff estimates the operational storage capacity of the subbasin to be 250,000 af.

Operational storage capacity is the volume of groundwater storage between the subsidence threshold and the operational maximum groundwater level. If the groundwater level drops below the subsidence threshold for an extended period of time, land subsidence can occur. Groundwater levels above operational maximum can interfere with recharge operations or cause basement flooding.

The Llagas Subbasin extends from Cochran Road, near Morgan Hill, south to the County's southern boundary. It is connected to the Bolsa Subbasin of the Hollister Basin and bounded on the south by the Pajaro River (the Santa Clara-San Benito County line). The Llagas Subbasin is approximately 15 miles long, 3 miles wide along its northern boundary, and 6 miles wide along the Pajaro River. The subbasin surface area is approximately 74 square miles. A thick clay layer which extends north from the Pajaro River divides this subbasin into confined and forebay zones. District staff has estimated the operational storage capacity of the subbasin at 150,000 af.

The Coyote Subbasin extends from Metcalf Road south to Cochran Road, and drains into both the Llagas and the Santa Clara Valley subbasins. This subbasin is approximately 7 miles long and 2 miles wide and has a surface area of approximately 15 square miles. The entire subbasin is unconfined and has no thick clay layers. District staff assumes no year-to-year operational storage volume for this subbasin.

TABLE 1-3
District Reservoirs
Significant Features

Reservoir	Capacity (af)	Year Complete	Surface Area (acres)	Dam Height (feet)
Almaden	1,780	1935	59	105
Anderson	89,073	1950	1,244	240
Calero	10,050	1935	347	98
Chesbro	8,952	1955	265	95
Coyote	22,925	1936	638	120
Guadalupe	3,723	1935	79	129
Lexington	19,834	1952	404	195
Stevens Creek	3,465	1935	92	120
Uvas	9,935	1957	286	118
Vasona	400	1935	58	30

A reservoir is a body of water that is collected and stored for future use. A dam is the structure that contains and controls the flow of reservoir water.

Recharge Facilities

The District owns and operates more than 30 recharge facilities in six major recharge systems. These facilities percolate both local and imported water into the groundwater aquifer. The annual average recharge capacity of these systems is 157,200 af/year. Stream recharge accounts for 50 percent of the recharge capacity. Significant features of these artificial recharge systems appear in Table 1-4.

TABLE 1-4
Artificial Recharge Systems

Recharge System	Existing Recharge Rate (af/year)	Average Summer Rate (af/day)	Average Winter Rate (af/day)
Westside	17,000	55	39
Los Gatos	42,000	134	117
Guadalupe	26,800	98	63
Penitencia	6,500	20	16
Coyote Valley	43,000	157	87
South County	21,900	60	60

Raw Water Conveyance System

The District operates several local pipelines to transport imported raw water and locally conserved water to various locations for treatment and distribution, or for groundwater recharge. The raw water conveyance system first meets the demands of the water treatment plants and then delivers the remaining water to recharge systems. This conveyance system consists of the Central Pipeline, the Rinconada Force Main, the Almaden Valley Pipeline, the Calero Pipeline, and the Cross Valley Pipeline. Another facility, the Stevens Creek Pipeline, taps off of the Rinconada Force Main and conveys raw water to recharge facilities on the County's west side.

The District owns and operates the Vasona Pumping Plant, with a total capacity of 1,200 horsepower. The District also operates two pumping plants on the San Felipe Project: the Pacheco Pumping Plant and the Coyote Pumping Plant, with a combined horsepower of 36,000.

Surface Water Treatment Facilities

Imported water comes to the County from the Sierra Nevada mountains via the Sacramento/San Joaquin Delta (Delta). This water is delivered by the State Water Project (SWP) and federal Central Valley Project (CVP) and sent to the District's water treatment plants (WTPs). It is treated before being delivered to water retailers, who in turn deliver the water to homes and businesses in the County. The District's three WTPs are described below.

The Rinconada Water Treatment Plant was constructed in 1967 at a cost of $9 million and can sustain a maximum flow rate of 75 million gallons per day (mgd) with an adequate margin of safety approved by the Department of Health Services to meet state drinking water standards. Of the 75 mgd capacity, 3 mgd are for internal use (backwash water, chemical feed water, etc.) and 72 mgd are wholesaled to water retailers.

The Penitencia Water Treatment Plant was constructed in 1974 at a cost of $5 million and can sustain a maximum flow rate of 42 mgd with an adequate safety margin. Of its capacity, 2 mgd are for internal use and 40 mgd are wholesaled to water retailers.

The Santa Teresa Water Treatment Plant was built in 1989 at a cost of $50 million and can sustain a maximum flow rate of 100 mgd with an adequate margin of safety. This level of production is not anticipated until well into the next century. This facility was built in 1989 at a cost of $50 million.

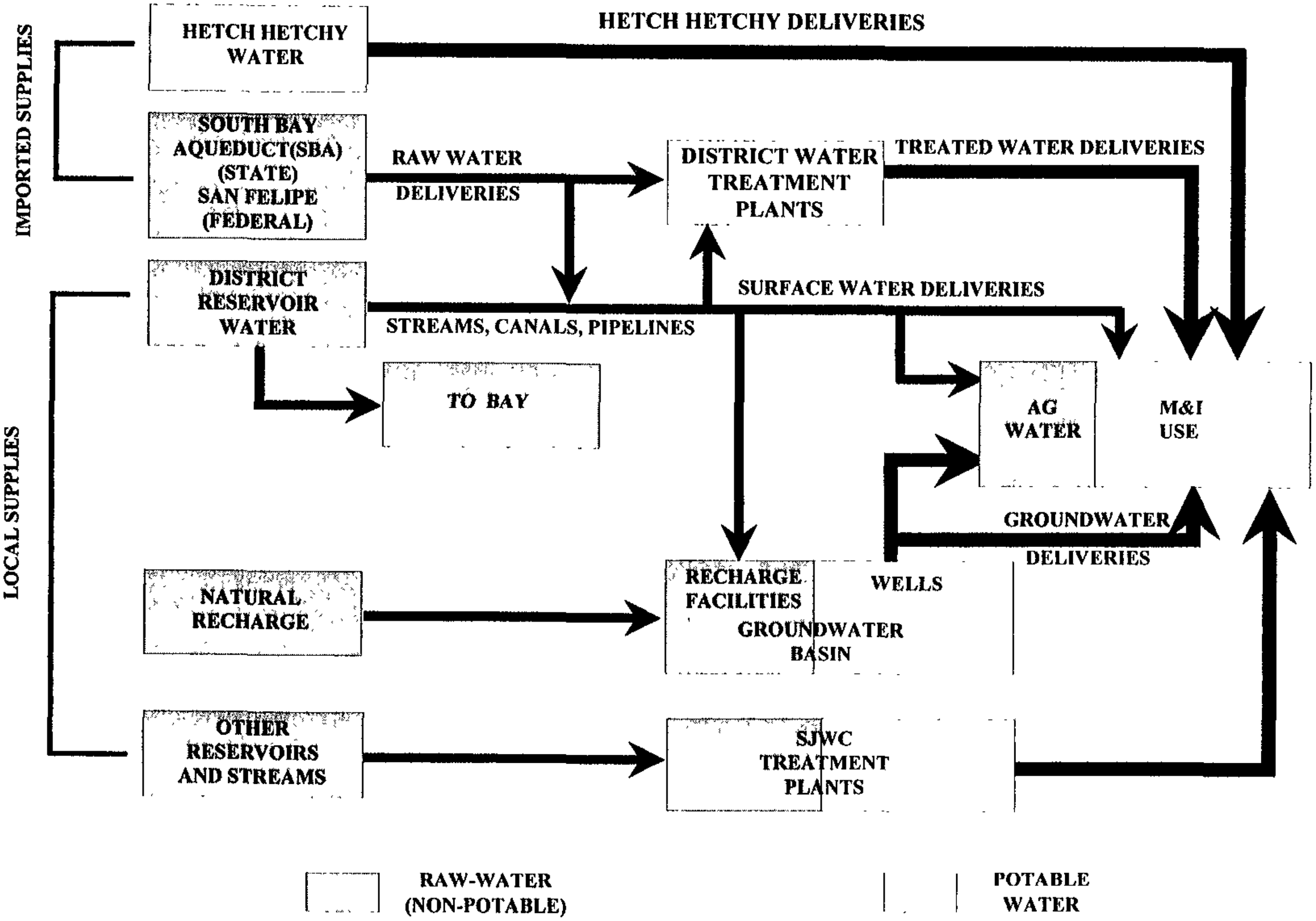
Imported Supplies

Imported water is conveyed to Santa Clara County through three main pipelines: The South Bay Aqueduct, which carries water from the SWP, and the Santa Clara Conduit and Pacheco Conduit, which bring water from the CVP. The City and County of San Francisco convey Hetch Hetchy water through their own facilities.

Water Distribution System

Figure 1-2 schematically represents how water distribution system components are utilized to serve the water demands of Santa Clara County.

FIGURE 1-2
System Distribution



Chapter 2
THE ROLE OF STAKEHOLDERS IN THE IWRP PROCESS

Public involvement has been a primary element of the IWRP process. This chapter describes community participation in the IWRP through a three-level "stakeholder" process, and explains how this involvement influenced IWRP outcomes.

What Is a "Stakeholder?"

In the District's IWRP process, a stakeholder is anyone who will be affected by or has an interest in the final plan. "Internal" stakeholders include District staff with technical expertise on water supply issues; "external" stakeholders include the general public, businesses, community and environmental groups, public officials, other water agencies, landscape professionals, and farmers.

Stakeholders' thoughts, questions, and recommendations were solicited through a variety of forums with the goal of developing a water supply strategy that reflects community interests and achieves maximum public acceptance.

The IWRP process is shaped by the premise that a wide array or combination of water resource options could meet the District's desired goals, and that any selected strategy must respond to community concerns in order to succeed. Through the stakeholder process, the District had an excellent opportunity to hear such concerns.

Internal Stakeholders

Internal stakeholders included the IWRP project team and other District staff. The project team consisted of District staff from the areas of water supply planning, water conservation, environmental planning, surface water and groundwater quality, economics, imported water, and public information. Team members managed the project, provided technical analysis, developed reports, presented information to external stakeholders and the media, and reported on the process to the Board. The project team met regularly with other District staff from a variety of disciplines who validated IWRP planning methodology and provided technical guidance. District staff involved in the IWRP process are listed at the front of this report.

External Stakeholders

External stakeholders helped verify the District's planning assumptions, reviewed IWRP objectives and evaluation criteria, and provided feedback on water resource strategies throughout the 10-month IWRP process. Stakeholders also informed the project team of community concerns, as described below. External stakeholders participated in the IWRP on three levels:

Level 1 Stakeholders: Core Group

Working closely with the IWRP project team, Level 1 stakeholders played a significant role in the development of the preferred strategy. This "core" group has indicated a strong desire to continue to assist the District in the IWRP's implementation phase.

Because they worked closely with the project team throughout the IWRP process, the Level 1 stakeholders were of particular importance in developing and refining the IWRP preferred water supply strategy. This "core" group of stakeholders included representatives from business, environmental, community, agricultural, academic and municipality/agency concerns. (See Table 2-1 for affiliations.) Showing a commitment to the IWRP public process, the Level 1 stakeholders attended five in-depth meetings in March, May, July, September, and November 1996, and an additional meeting with the Board in October 1996. In addition to conveying individual viewpoints as community leaders, these stakeholders also helped refine planning objectives, review water supply options and resource strategies and shape the final preferred strategy—as well as reporting back to their various groups about the IWRP process.

For a complete record of Level 1 meetings, including stakeholders' questions, comments, and recommendations and responses from District staff see Appendix B.

Incorporating Level 1 Stakeholder Input

Level 1 stakeholders directly influenced several key elements of the IWRP process, including:

- **Identifying Key Planning Objectives.** At their first meeting in March 1996, Level 1 stakeholders identified the following planning objectives as most important: minimizing costs to the community, providing equal reliability of water supply, meeting level of service goals, promoting efficient water use, and ensuring water quality. As a result of stakeholder input, these objectives remained foremost throughout the planning process. In addition, the reliability and level of service objectives became baseline design criteria for all subsequent water supply strategies developed by the project team.
- **Expanding the Water Quality Objective.** A member of the Level 1 group worked with the project team to expand the planning objective regarding water quality. The objective originally read "Ensure Water Quality that Always Meets or Exceeds Aesthetic Issues and All Applicable Standards." To address the additional issue of source water quality, the objective was changed to "Maximize the Quality and Treatability of Source Water." The new version was endorsed by the Level 1 stakeholders at their July meeting and used for the remainder of the IWRP process.

- **Developing Hybrid Strategies.** At their July meeting, Level 1 stakeholders split into breakout groups to address the composition of hybrid strategies. The groups agreed on four common components: water transfers, water recycling, water banking, and conservation. In response to this input and the advice of internal stakeholders, the project team focused the hybrid strategies around these four components.

- **Ranking the Importance of Costs.** Level 1 stakeholders ranked cost and rate impacts low in importance compared to other water supply planning objectives, such as those regarding reliability and water quality. Thus, while one of the hybrid strategies developed during the IWRP process was specifically designed to minimize costs, the preferred strategy instead attempts to satisfy a broad variety of planning objectives, including minimizing costs.

Divided into breakout groups, Level 1 stakeholders constructed three water supply strategies to meet projected shortfalls. Significantly, despite differences in stakeholders' individual viewpoints, the resulting strategies relied on the same four primary components: demand management (water conservation), water recycling, water banking, and water transfers. These same four components are the basis for the IWRP preferred strategy.

- **Broadening the Discussion.** At their September meeting, Level 1 stakeholders asked for time to discuss concerns outside of the scheduled meeting agenda. As a result, the project team arranged for an additional meeting between the Level 1 stakeholders and the Board in late October. This meeting had no scheduled presentations and provided the opportunity for an open discussion between external stakeholders and the Board.

- **Endorsing the Preferred Strategy.** Throughout the 10-month IWRP development phase, Level 1 stakeholders focused on the project's essential mission: to meet future water supply demands. However, stakeholder discussions also raised related issues, including potential partnerships on water recycling and other components, regional economic well-being, and local growth. These issues surfaced at the final meeting of the core group on November 14, 1996. Level 1 stakeholders endorsed the IWRP strategy, predicating their support on several factors. Among stakeholder suggestions were the following: that the District work jointly with wastewater agencies to ensure that District water supply programs and wastewater agency disposal programs are more closely aligned, and that the District enhance the preferred strategy's core elements to include analysis of the distribution, costs, and benefits associated with recycled water throughout Santa Clara County.

TABLE 2-1
Level 1 External Stakeholders

Academic Community	**Professor Burton V. Dean**, School of Business, San Jose State University
Agricultural Community	**Ms. Nancy Richardson**, Executive Director, Santa Clara County Farm Bureau
Business Community	**Ms. Elizabeth Zimmerman**, Director of Environmental Programs, Santa Clara Valley Manufacturing Group
	Mr. James Tucker, Director of Economic Development, San Jose Chamber of Commerce
	Ms. Connie Martinez, Executive Director Joint Venture Silicon Valley Economic Development Team
County Planning	**Ms. Leode Franklin**, Director Environmental Resources Agency of Santa Clara County
	Mr. Paul D. Romero, Director, Santa Clara County Parks and Recreation Department (Alternate)
District Agricultural Water Advisory Committee	**Mr. Peter Van Dyke**, Chair, District Agricultural Water Advisory Committee; Farmer
	Mr. Fred Angelino, Member, District Agricultural Water Advisory Committee; Farmer (Alternate)
District Flood Control Zone Advisory Committees	**Mr. Dean R. Chamberlin**, Chair, Central/North Central Flood Control Advisory Committee; Formerly Campbell City Council Member
	Ms. Suellen Rowlison, Chair, South Flood Control Zone Advisory Committee; Gilroy City Council Member (Alternate)
District Landscape Advisory Committee	**Mr. Doug Nakamura**, Chair, District Landscape Advisory Committee; General Manager, Northwest Landscape Maintenance Co.
Environmental Groups	**Ms. Julia Bott**, Chapter Director, Sierra Club Loma Prieta Chapter
	Mr. Craig Breon, Environmental Advocate, Santa Clara Valley Audobon Society
Homeowners	**Mr. Roald Alexander**, Vice Chair, United Neighborhoods of Santa Clara County
Other Water Agencies	**Mr. Steve Ritchie**, Manager, Bureau of System Planning and Regulatory Compliance; San Francisco Public Utilities Commission
	Mr. Art Jensen, General Manager, San Francisco Bay Area Water Users Association
Public Advocacy Groups	**Ms. Marcia Allen**, Member, League of Women Voters
Wastewater/Water Recycling	**Mr. Louis N. Garcia**, Director, City of San Jose Environmental Services
Water Retailers	**Ms. Lorrie Gervin**, Division Manager, City of San Jose Municipal Water System
	Mr. Scott Yoo, Vice President of Water Quality, San Jose Water Company

Level 2: All-Day Community Forum

To build on work done by the Level 1 stakeholders, and to gain a broader community perspective on IWRP issues, the District held a public forum for Level 2 stakeholders on August 5, 1996. Participants, who were invited from an extensive list of community, business, environmental, civic and cultural groups, ranked different water-related issues and evaluated thematic strategies that addressed those issues. Level 2 feedback was incorporated into IWRP strategy-building sessions and focused primarily on issues of community acceptance and environmental impacts. Appendix C contains a record of the forum and the questions and comments generated during this event.

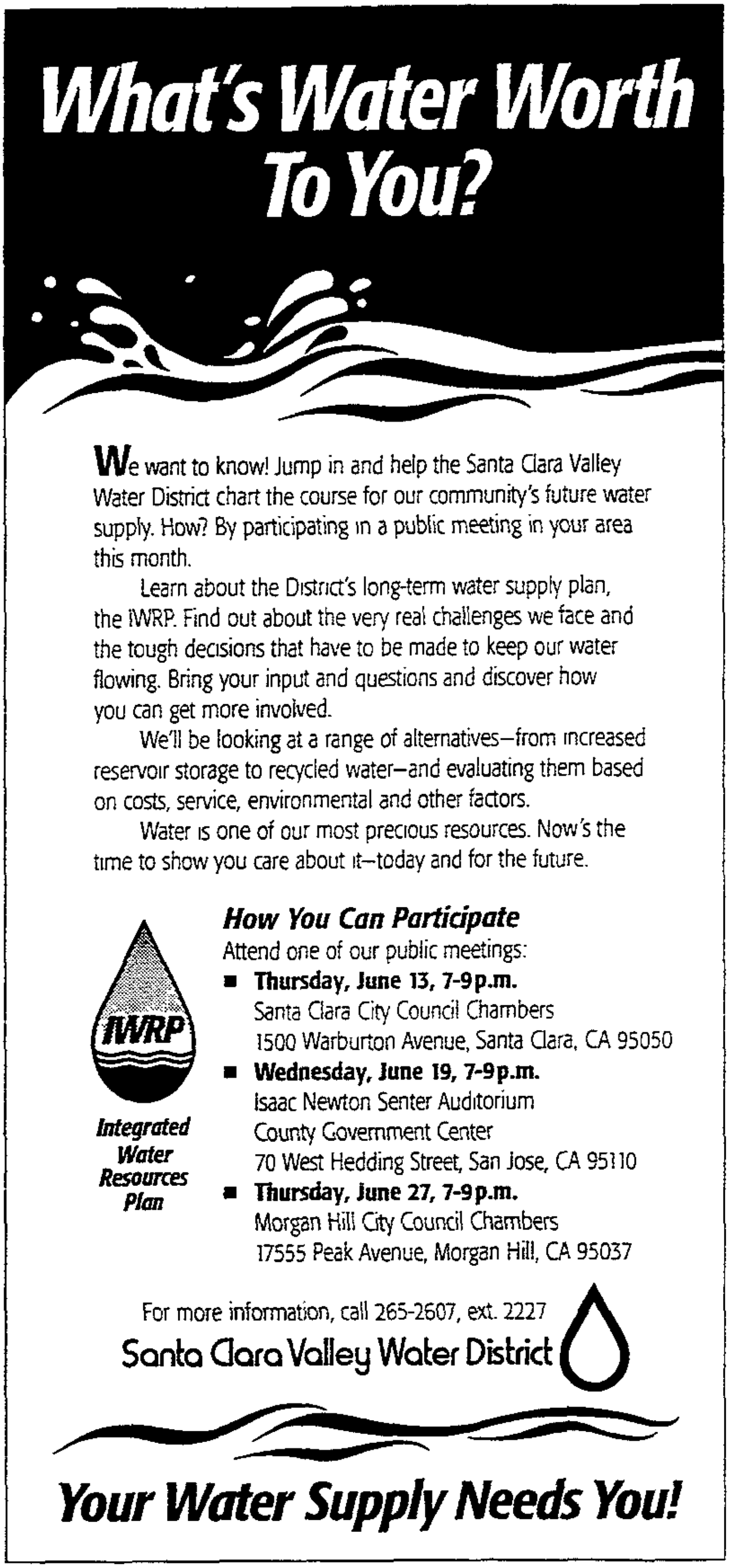
The IWRP's stakeholder process has proven both exciting and invaluable for the District. It has allowed for more direct and open communication between the District and its constituents, and has opened the way for further public-oriented planning processes in other District projects. Ultimately, the stakeholder process delivered what both the District and the community at large hoped for: a workable, flexible plan to meet potential water supply shortfalls while reflecting community priorities.

Level 3: The General Public

The general public represented the third level of external stakeholders. Because public awareness of water supply issues is so important to the IWRP process, the project team used several methods to reach the largest audience possible on IWRP developments, including:

- **June Public Meetings**. In June 1996, three public meetings were held in the north, central, and south parts of the County to present the IWRP project and respond to public inquiries and concerns about future water supply issues. Ads for the meetings were run in more than 20 newspapers (English-, Spanish-, and Chinese-language), public service announcements were broadcast via local radio (see Figure 2-1), and press releases resulted in local media coverage. Participants in the June meetings identified water recycling, environmental mitigation, local storage, and water quality as key concerns. Level 3 participants also had the opportunity to sign up for the August Level 2 forum and to receive notification of future public meetings on the IWRP process.
- **November Public Meeting.** The District ran a second ad campaign to publicize a final public meeting on November 20, 1996 (see Figure 2-2). In addition, project team staff mailed notices to approximately 4,000 interested parties, and distributed public service announcements and press releases, which resulted in local media coverage. At the November meeting, which was held at District headquarters, project team staff presented the draft preferred strategy, distributed informational

FIGURE 2-1
Sample IWRP Advertisement



What's Water Worth To You?

We want to know! Jump in and help the Santa Clara Valley Water District chart the course for our community's future water supply. How? By participating in a public meeting in your area this month.

Learn about the District's long-term water supply plan, the IWRP. Find out about the very real challenges we face and the tough decisions that have to be made to keep our water flowing. Bring your input and questions and discover how you can get more involved.

We'll be looking at a range of alternatives—from increased reservoir storage to recycled water—and evaluating them based on costs, service, environmental and other factors.

Water is one of our most precious resources. Now's the time to show you care about it—today and for the future.

IWRP

Integrated Water Resources Plan

How You Can Participate

Attend one of our public meetings:

- **Thursday, June 13, 7-9p.m.**
  Santa Clara City Council Chambers
  1500 Warburton Avenue, Santa Clara, CA 95050
- **Wednesday, June 19, 7-9p.m.**
  Isaac Newton Senter Auditorium
  County Government Center
  70 West Hedding Street, San Jose, CA 95110
- **Thursday, June 27, 7-9p.m.**
  Morgan Hill City Council Chambers
  17555 Peak Avenue, Morgan Hill, CA 95037

For more information, call 265-2607, ext. 2227

Santa Clara Valley Water District

Your Water Supply Needs You!

FIGURE 2-2
Public Meeting Advertisement

You're invited!

Get Water Wise!

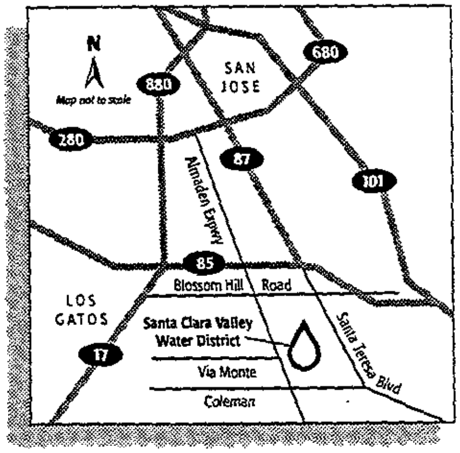
Find out what the Santa Clara Valley Water District's been planning to keep high-quality water flowing to the year 2020.

Integrated Water Resources Plan

You're invited to a public meeting on the district's long-term water supply project–the Integrated Water Resources Plan (IWRP)–on November 20, 1996. We look forward to presenting our draft recommended water supply strategy and responding to your questions and comments. For more information, please call: 408-265-2607, extension 2076. See you there!

PUBLIC MEETING

Wednesday, November 20, 1996
7:00 p.m. to 9:00 p.m.
Santa Clara Valley Water District Board Room
5750 Almaden Expressway, San Jose, CA 95118



Santa Clara Valley Water District

materials and responded to questions. Participants were informed that the District Board of Directors would be taking action on the draft strategy at their meeting on December 10, and were invited to attend the meeting.

- **Newsletters.** To provide additional outreach on the IWRP project, project team staff wrote and distributed a newsletter, *The IWRP Report.* Two issues have been distributed, and a third is planned for Spring 1997. The newsletter is mailed to a list of more than 4,000, which includes residents, businesses, community, agricultural and environmental groups, local municipalities and other water agencies. It is also distributed at public events in which the District participates.

Appendix D contains a complete list of Level 3 stakeholders' questions and comments, brief responses from District staff, and examples of public outreach materials.

The IWRP's stakeholder process has proven both exciting and invaluable for the District. It has allowed for more direct and open communication between the District and its constituents, and has opened the way for further public-oriented planning processes in other District projects. Ultimately, the stakeholder process delivered what both the District and the community at large hoped for: a workable, flexible plan to meet potential water supply shortfalls while reflecting community priorities.

Chapter 3
IWRP PLANNING OBJECTIVES AND EVALUATION CRITERIA

This chapter describes the planning objectives that were used to evaluate water supply alternatives developed during the IWRP process.

Overview of Planning Objectives

One of the first tasks of the IWRP was to develop planning objectives to guide development of water supply alternatives and companion evaluation criteria to measure how well any proposed alternatives met these objectives. In 1995 the Board agreed upon a series of 13 IWRP planning objectives and corresponding evaluation criteria. District staff met with external stakeholders in March, May, and July 1996 to review and refine these objectives and criteria; as a result, the original list of objectives was expanded to 15.

To facilitate discussion and evaluation, the 15 planning objectives were grouped into five categories: operational, risk, economic, community, and environmental. The original order of the objectives as established by the Board was changed to reflect these categories. Table 3-1 presents the final complete list of planning objectives. The remainder of this chapter is organized according to the five objective categories.

TABLE 3-1
IWRP Water Supply

IWRP Objectives	*Categories*
1. Provide Equal Reliability of Water Throughout the County	Operational
2. Maximize System Flexibility	
3. Maximize Effective Use of Water Supply	
4. Maximize Multi-Purpose Potential for Integrating District Functions	
5. Meet Level of Service	
6. Minimize Risk of Providing Supplies	Risk
7. Maximize Ability to Respond to Changing Conditions	
8. Minimize Total District Costs	Economic
9. Minimize Rate Impacts	
10. Protect Economic Well-Being of County by Minimizing Costs to the Community	Community
11. Include Public Involvement and Maximize Public Acceptance	
12. Maximize Opportunities for Recreation and Environmental Uses	
13. Maximize the Quality and Treatability of Source Water	
14. Promote Efficient Water Use	
15. Avoid or Minimize Adverse Impacts to Habitat or Ecosystems	Environmental

*Objectives 3 and 7 were added by the project team during the IWRP process.

*The title of Objective 13 was revised in response to comments the District received during the May 5, 1996 Level I external stakeholder meeting. The objective formerly read "Ensure Water Quality that Always Meets or Exceeds Aesthetic Issues and all Applicable Standards"

Operational Category

Five operational objectives were developed. These focus on issues of availability of water throughout the County, ability to complement the existing infrastructure, effective use of supply, integrating the District's various functions, and the level of service the alternatives will provide.

Objective 1: Provide Equal Reliability of Water Throughout the County

Definition

Any alternative must provide equal availability of water service to all existing and future retailers, residential, agricultural and business customers, independent of the source of their supplies under normal conditions.

The Board has adopted a policy (Resolution 68-4) to equalize the availability of water throughout the District by "every means available to it to the fullest extent consistent with equity and sound conservation principles." This policy implies that the District will deliver available water equally among all retailer, residential, agricultural, and business consumers within the District. New growth within the District will be accommodated under the same equitable distribution policy.

This objective relates to the ability of the system to convey water to all parts of the County. It does not refer to the quantity of water required to meet the County's demands, nor does it address the issue of how cutbacks will be made in the case of mandatory water use restrictions. These concerns are addressed in Objective 5 regarding level of service.

Evaluation Criteria

Can the system provide water throughout the northern and southern parts of the County as well as at the boundaries of the District's service area?

Is the likelihood of disruption the same throughout the system? That is, are some areas of the system more apt to fail than others?

Objective 2: Maximize System Flexibility

Definition

Any alternative must have the ability to complement or integrate with existing infrastructure.

Evaluation Criteria

Can changes in water demand in different areas from those forecasted be accommodated?

Will the alternative allow the system to adapt to changes in water supplies?

Can the alternative integrate with or complement the existing infrastructure?

Objective 3: Maximize Effective Use of Water Supply

Definition

An alternative that satisfies this objective would more effectively use existing water supplies that are abundant and unused in wet and average years for subsequent use during dry years. To maximize the effective use of water supplies, an alternative would either store water when it was abundant for use during dry periods or would purchase supplies only in those years when they are needed.

Evaluation Criteria

Does the alternative enhance the District's ability to efficiently use its existing supply sources accumulated during wet and average years?

Does the alternative require the District to purchase excess water?

Objective 4: Maximize Multipurpose Potential for Integrating District Functions

Definition

This objective was used to evaluate how well the functions the District is responsible for (other than water supply) are also integrated into the water supply alternative. These functions include flood control, water quality, nonpoint source pollution control and power generation within the County in an environmentally sound manner. The internal stakeholders group helped to ensure that water supply strategies were aligned with these functions. This objective also encourages maximizing the use of technical expertise within the District to achieve a common water resource management purpose.

Evaluation Criteria

Have water quality impacts been minimized?

Have flood control benefits and cooperative programs been maximized?

Have impacts on nonpoint source pollution control been minimized?

Objective 5: Meet Level of Service

Definition

Any alternative that satisfies this objective would have enabled the District to meet all of the water needs in the County during the recent drought of 1987-1992.

Evaluation Criteria

Does the alternative (a) ensure a water supply that meets the County's projected water demands during a dry period that is as severe as the 1927-1934 period but no greater in severity, and (b) not impose an emergency outage that compounds the drought impact?

Does the alternative prevent the resumption of groundwater basin subsidence?

Risk Category

Two objectives are associated with this category. These objectives focus on risks that may jeopardize the District's supplies and its ability to respond to changing supply or demand conditions.

Objective 6: Minimize Risk of Providing Supplies

Definition

Alternatives must take into consideration the climatic, regulatory, and political forces which shape the availability and reliability of water throughout California. Natural disasters, such as earthquakes, fires, and flooding, also pose risks. The many types of risks that may jeopardize the District's supplies are described below.

- Risks from uncertainties in forecasting local and imported supplies. For example, uncertainties due to annual or short-term hydrologic variations, hydrologic cycles that may last for decades, and long-term climatic changes.

- Risks of reduced local or imported supplies due to federal, state, or local regulatory actions. For example, Endangered Species Act (ESA) implementation, Congressional mandates (e.g., Central Valley Project Improvement Act [CVPIA]), Safe Drinking Water Act, State Water Resources Control Board (SWRCB) water rights adjudications, implementation of Fish and Game codes, etc.
- Risks due to changing institutional structures or political climates. For example, potential changes in ownership of major water projects may impact the District's imported supplies.
- Risks to achieving full implementation of planned projects or programs. For example, delays in project implementation due to inability to secure necessary permits or clearances, lack of funding, or changed environmental conditions.
- Risks from uncertainties in underlying data or assumptions. For example, inherent in the local supplies assumptions are the assumed groundwater storage capacities and yield which may be refined in the future with better information.
- Risks to water supplies resulting from system operations to meet conflicting priorities or limitations in system capacities.
- Risks of system outage due to natural or human-induced disasters. For example, earthquakes, fires, flooding, breakages, contamination, and system failures are risks to the District in providing a continuous supply.
- Risks of permanent damage to infrastructure or facilities. For example, certain water management practices may increase risks of reinitiating land subsidence or salt water intrusion.
- Risks related to committing major capital investments in facilities that may not be required. For example, expenditures on the construction of a major facility could turn out to be unnecessary if projected demands prove higher than actual demands.
- Risks of changes in drinking water regulations and the likelihood of being unable to comply with future drinking water standards.

Level 1 external stakeholders commented at the May 9, 1996 meeting that the evaluation of alternatives should include their ability to comply with drinking water regulations.

Evaluation Criteria

How much does the alternative depend on the status quo or projected future conditions?

What is the margin of error or consequence of wrong assumptions?

How well can an alternative cope with changed conditions or deviations from expected outcomes?

How well does it minimize liabilities?

What level of system redundancy and interties does it permit?

What magnitude and duration of emergency outages is it vulnerable to?

How well does it minimize the potential for infrastructure damage?

Objective 7: Maximize Ability to Respond to Changing Conditions

Definition

It is expected that future supply and demand conditions will deviate from our current baseline assumptions or from our current state of knowledge. Therefore, alternatives were developed in ways that allowed for flexibility to respond to future changing demand or supply conditions. Alternatives that are modular or preserve a wide range of options rated higher under this criterion. Alternatives that are highly irreversible or require high degrees of early commitments rated lower under this criterion.

Objective 7 was added in response to comments the District received at the July 11, 1996 Level 1 external stakeholder meeting.

Evaluation Criteria

Does the alternative allow for flexibility in anticipation of changing supply and demand conditions?

Are contingency options available in the event that unanticipated changes in supply or demand conditions or regulatory climates occur?

Does the alternative lend itself to a modular or phased implementation approach?

Economic Category

Two objectives are included in the economic category. The intent of both objectives was to identify strategies that minimize costs to the District and, ultimately, the rates paid by the District's customers. The costs included in this category were limited to District costs and did not include costs incurred by others.

Objective 8: Minimize District Costs

Definition

This objective deals with both the initial capital invested in facilities and the subsequent operating costs over the life of the alternative. For each supply component, capital and operating costs were estimated and the component's life-cycle cost from the present to 2020 were calculated. As components were combined into resource strategies the life-cycle costs of each component were summed to calculate the total resource strategy cost.

Evaluation Criteria

What is the life-cycle cost of the alternative?

Objective 9: Minimize Rate Impacts

Definition

This objective translates the costs of a resource alternative into the effects on rates charged to District customers. Alternatives with similar life-cycle costs may have a similar overall rate impact during the planning period, but may differ considerably with respect to the timing and magnitude of single-year rate increases. This objective also evaluated the rate impacts of alternatives which required water rationing.

The rate impacts were assessed assuming the District's current rate structure continues over the planning period. Strategies were compared on the basis of their incremental unit cost averaged over all water sold to the District's customers. The changes in the District's wholesale rates were traced through to estimate impacts on typical monthly residential bills.

Evaluation Criteria

What is the rate impact of the alternative in the years 2000, 2010, 2020?

Community Category

Five key objectives address both the community's and the District's interests. These include public cost minimization, public involvement, recreation, water quality, and water conservation.

Objective 10: Protect Economic Well-Being of the County by Minimizing Costs to the Community

Definition

Alternatives must meet the water needs of all users in a cost-effective manner. The total cost of water supply to the community includes investments by the District as well as by other agencies, private companies, and individuals. Therefore, the IWRP estimated total capital and operating outlays by all parties, differentiating District costs and total community costs, both direct and indirect. The analysis also considers factors that affect the community's economic competitiveness.

Evaluation Criteria

Does the alternative keep costs to business enterprises, agencies, and residents low and benefits supporting economic competitiveness high, relative to other geographic areas? (Business enterprises include commercial, agricultural, and industrial enterprises.)

Does the alternative encourage the number of jobs in the County to stay the same or increase?

Objective 11: Include Public Involvement and Maximize Public Acceptance

Definition

The success of any water resource alternative depends on its ability to reflect the priorities of a broad cross section of the community. The IWRP process included representation from groups that reflected a wide array of community interests in and perspectives on short- and long-term water supply use in the County. This objective also dealt with public acceptance of a given alternative.

Evaluation Criteria

(These criteria determine which public involvement strategy to select for the next phase of the IWRP process.)

Does the selection process provide and support educational outreach for public groups and the general public?

Is public input actively solicited from a wide variety of public groups? (Public groups include public agencies and organizations which are private or governmental.)

Is public input a key factor in creating District plans and policies?

Is public education required to achieve support for an alternative?

Objective 12: Maximize Opportunities for Recreation and Environmental Uses

Definition

The alternative must maximize opportunities for recreational access to and environmental benefits of multi-use water supply facilities in the County, such as reservoirs, streams, and streamside trails.

Evaluation Criteria

Does the alternative maximize the potential for trail use? Evaluation factors may include maximizing trail use for bicycling, horse riding, bird watching, etc.

Does the alternative maximize the potential for water recreation? Evaluation factors may include fishing, boating, water skiing, etc.

Objective 13: Maximize the Quality and Treatability of Source Water

The title of Objective 13 formerly read, "Ensure Water Quality that Always Meets or Exceeds Aesthetic Issues and all Applicable Standards." The title, definition and evaluation criteria were revised in response to comments the District received at the May 9, 1996 Level 1 stakeholder meeting. A representative from the water retailer industry worked with District staff to help develop the revised language.

Definition

Alternatives should maximize the quality and treatability of source water and result in drinking water that is aesthetically acceptable to consumers and consistently meets all state and federal water quality standards for its intended use.

Evaluation Criteria

Would potable water consistently meet existing and anticipated drinking water standards and aesthetic objectives with existing or currently planned treatment facilities?

Would the quality of groundwater extracted from a drinking water aquifer by a private well owner or municipal water retailer consistently meet current and anticipated state and federal water quality requirements and aesthetic objectives for the groundwater's intended use?

Would the quality of surface water directly used by a qualified raw surface water user consistently meet current and anticipated state and federal water quality requirements and aesthetic objectives for the water's intended use?

Would the alternative contribute to operational flexibility in selecting the highest source water quality available? This criterion addresses the need to avoid major fluctuations in treatability or aesthetic quality of the source water. If the alternative results in widely fluctuating source water quality, operational flexibility is needed to temporarily switch to a higher quality source for processing treated water.

Objective 14: Promote Efficient Water Use Including Full Implementation of Water Conservation BMPs and Identified Potential BMPs, and Discourage the Wasteful Use of Water

Definition

Alternatives should encourage water conservation by all members of the public in order to implement all potential Best Management Practices (BMPs) and use water more efficiently.

Evaluation Criteria

Does the alternative allow full promotion and support of all existing and potential water conservation BMPs?

Does it allow for educational outreach to the County population in order to assist the community in conserving water?

Does it accommodate coordination with other public groups to maximize water reuse and conservation?

Environmental Category

A single objective is included in this category: Avoid or minimize adverse impacts to habitat or ecosystems. Impacts evaluated under this objective included direct, indirect, and cumulative impacts. The relative potential environmental impacts of the alternatives were evaluated at a program level, rather than a project-specific level, because site-specific information was not available. The IWRP report is a feasibility study that identifies a preferred strategy to meet the County's future water supply needs. CEQA and other environmental regulations do not apply, but may be required at a later date when specific measures are adopted by the Board.

Objective 15: Avoid or Minimize Adverse Impacts to Habitat or Ecosystems

Definition

Water supply alternatives must avoid or minimize adverse environmental impacts. Environmental resources that were evaluated include fish, wildlife, botanical resources, waters of the U.S., including wetlands and other aquatic habitats, and cultural resources. Aesthetic impacts were also considered.

An alternative that could avoid or minimize adverse impacts to habitats was preferred over one that would have a high likelihood of adverse impacts requiring compensatory mitigation. Pipeline construction is an example of a strategy that could avoid or minimize adverse impacts if it were aligned in a manner that would result in minimal disturbance to wildlife habitat.

Evaluation Criteria

Does the alternative avoid or minimize adverse impacts to fisheries resources? Evaluation factors that would be used to determine if fisheries resources are impacted would include, among other things, suitable stream temperatures for native species at all life stages, spawning habitat for salmonids, and food chain support, when possible. Strategies were also assessed for their impacts to fish migration (e.g., fish screen barriers) and in-stream flows.

Does it avoid or minimize adverse impacts to wildlife resources? Potential impacts to populations or habitats of sensitive, aquatic, and terrestrial wildlife species were evaluated. Alternatives that would result in lower cumulative environmental impacts to wildlife resources were preferred.

Does it avoid or minimize adverse impacts to botanical resources? Evaluation factors to determine if botanical resources are impacted include changes in the hydrologic regime, establishment of invasive plant species, and habitat fragmentation, among others. It is also desirable to minimize cumulative environmental impacts of strategies.

Does it avoid or minimize adverse impacts to the waters of the United States, including wetlands?

Does it avoid or minimize adverse impacts to cultural resources such as archaeological and historic sites?

Does it avoid or minimize adverse impacts to the visual and aesthetic environment?

Chapter 4
IWRP DECISION-MAKING MODEL

The District has developed a four-step decision-making model to compare and evaluate potential resource strategies for meeting the future water supply needs of the County. This model provides a systematic methodology for selecting a preferred strategy from a multitude of individual water resource options. The foundation of the decision-making model is the set of IWRP planning objectives presented in Chapter 3.

This chapter describes each of the steps in the decision-making process and identifies the criteria and decision-making tools that have been employed. This process is similar to that used by other water agencies and organizations needing to make choices that involve potentially competing objectives.

Overview

There are four major steps in the decision-making process, as illustrated in Figure 4-1:

1. Screening individual water supply and demand-management options to identify the better options within a given technology.
2. Assembling screened supply and demand-management components into resource strategies.
3. Evaluating strategies using the planning objectives and evaluation criteria.
4. Selecting the preferred strategy.

Step 1: Option Screening

The first step in the IWRP process was to screen individual demand-management and supply options, such as "conservation" or "reservoir storage." Five planning objectives were identified as most suitable for the option screening process because they served to differentiate among the options.

- Maximize System Flexibility
- Minimize Risk of Providing Supplies
- Minimize District Costs
- Maximize the Quality and Treatability of Source Water
- Avoid or Minimize Adverse Impacts to Habitat or Ecosystems

FIGURE 4-1
IWRP Decision-Making Model

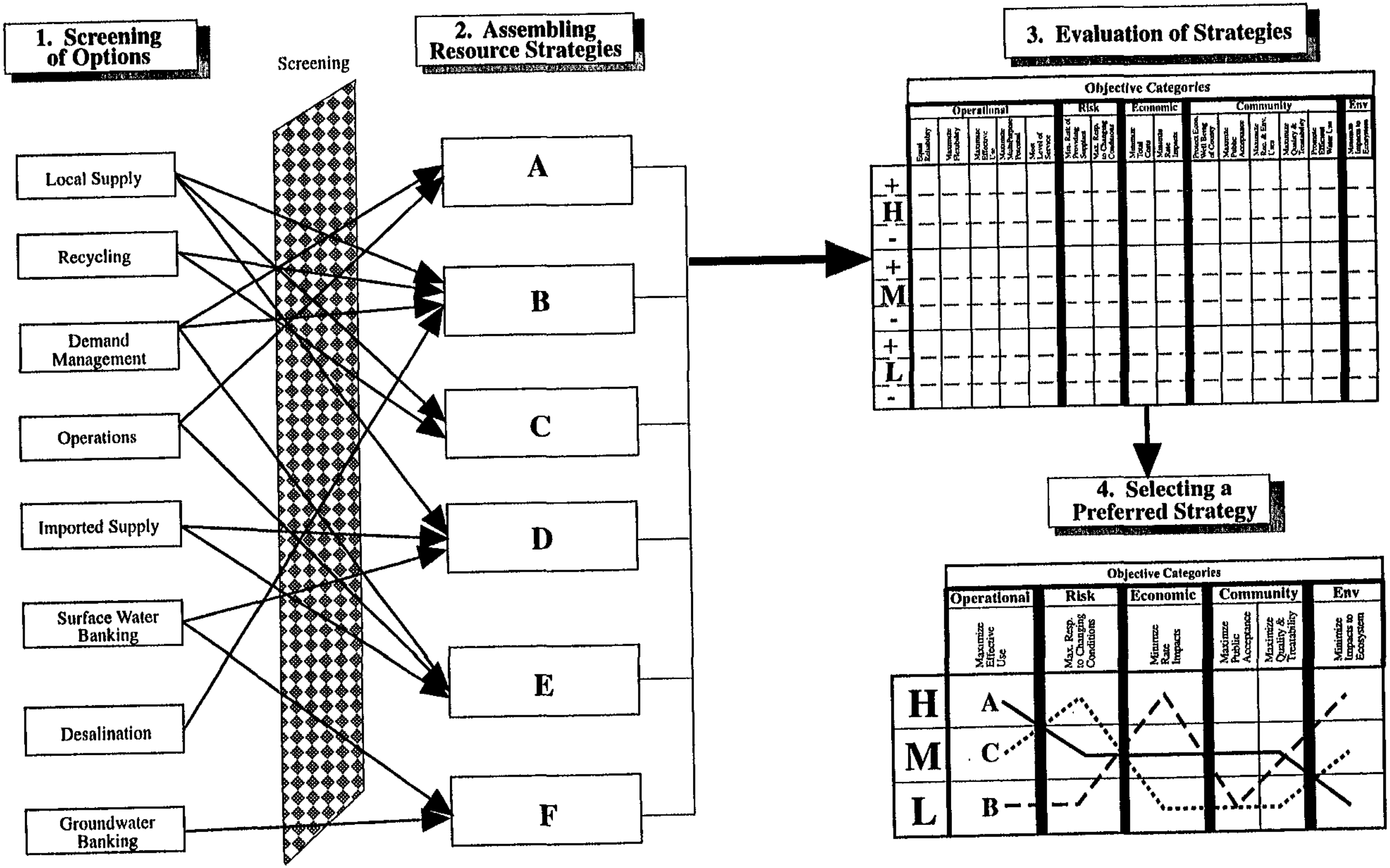

1. Screening of Options
Screening
2. Assembling Resource Strategies
3. Evaluation of Strategies
Local Supply
Recycling
Demand Management
Operations
Imported Supply
Surface Water Banking
Desalination
Groundwater Banking
A
B
C
D
E
F
Objective Categories
Operational
Risk
Economic
Community
Env
Equal Reliability
Maximize Flexibility
Maximize Effective Use
Maximize Multi-Purpose Potential
Meet Level of Service
Min. Risk of Providing Supplies
Max. Resp. to Changing Conditions
Minimize Total Costs
Minimize Rate Impacts
Protect Econ. Well Being of County
Maximize Public Acceptance
Maximize Rec. & Env. Uses
Maximize Quality & Treatability
Promote Efficient Water Use
Minimize Impacts to Ecosystem
+
H
-
+
M
-
+
L
-
4. Selecting a Preferred Strategy
Objective Categories
Operational
Risk
Economic
Community
Env
Maximize Effective Use
Max. Resp. to Changing Conditions
Minimize Rate Impacts
Maximize Public Acceptance
Maximize Quality & Treatability
Minimize Impacts to Ecosystem
H
M
L
A
C
B

Table 4-1 highlights these five objectives and provides a matrix for recording the outcome of the options screening. Options that best met these objectives were carried forward as "components"—building blocks for the creation of the resource strategies. Options that were less successful at satisfying the objectives were held for future consideration. A summary of the options screening results appears in Appendix E.

Table 4-2 provides rating guidance for evaluating the performance of the options and strategies in achieving the planning objectives. The table identifies the reasons behind assigning a rating of high, medium, or low to each option or strategy.

Steps 2 and 3: Resource Strategy Development and Evaluation

A resource strategy is a combination of different components that "solves" or meets the District's future water needs. While all of the resource strategies were designed to achieve this overall goal, they each achieve the planning objectives with varying degrees of success. Some strategies rate well against one objective but low for the other objectives; others respond fairly well, or poorly, to a majority of the objectives.

Development of resource strategies occurred in two rounds:

Round One: Developing Thematic Strategies

The first group of resource strategies were "thematic"; that is, they each emphasized a different theme and incorporated similar components. The thematic strategies are:

1. Baseline
2. Demand Management
3. Recycled Water
4. Maximize Local Storage
5. New Surface Storage
6. Water Banking
7. Long-Term Transfers
8. Short-Term (As-Needed) Transfers

These strategies represent the range of possible solutions from demand reduction to structural-based supply enhancements, and yield information on the tradeoffs and dynamics of combining one component with another. A complete discussion of the development and evaluation of the thematic strategies appears in Chapter 8.

TABLE 4-1
Matrix for Screening IWRP Options

	Objective Categories*												
	Operational				Risk	Economic		Community					Env
	Equal Reliability	Maximize System Flexibility	Maximize Multipurpose Potential	Meet Level of Service	Min. Risk of Providing Supplies	Minimize District Costs	Minimze Rate Impacts	Protect Econ. Well Being of County	Maximze Public Acceptance	Maximize Rec. & Env. Uses	Maximize Quality & Treatability	Promote Efficient Water Use	Minimize Impacts to Ecosystem
+													
H													
-													
+													
M													
-													
+													
L													
-													

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* This matrix includes the original 13 planning objectives established by the Board.

TABLE 4-2
Rating Guidance For Planning Objectives

OBJECTIVE	RATING	
OPERATIONAL		
1. Provide Equal Reliability of Water Throughout the County	High	Improves reliability to a major part of service area.
	Medium	Improves reliability to a small part of service area.
	Low	No improvement in reliability in service area.
2. Maximize System Flexibility	High	Complements or integrates with existing system well.
	Medium	Complements or integrates with existing system moderately.
	Low	Complements or integrates with existing system poorly.
3. Maximize Effective Use of Water Supply	High	Enhances effective use of local and imported water supplies through recycling, storage, and conservation.
	Medium	Moderate enhancement of effective use of available water supplies.
	Low	Little or no enhancement of effective use of available water supplies.
4. Maximize Multipurpose Potential for Integrating District Functions	High	Improves water quality and flood management.
	Medium	Minor impact on water quality and flood management.
	Low	Degrades water quality and flood management.
5. Meet Level of Service	High	Meets Level of Service goal.
	Medium	Partially meets Level of Service goal.
	Low	Does not meet Level of Service goal.
RISK		
6. Minimize Risk of Providing Supplies	High	Minimal risk associated with implementation and expected performance under a variety of conditions.
	Medium	Moderate risk associated with implementation and expected performance under a variety of conditions.
	Low	High risk associated with implementation and expected performance under a variety of conditions.

TABLE 4-2
Rating Guidance For Planning Objectives
(continued)

OBJECTIVE	RATING	
7. Maximize Ability to Respond to Changing Conditions	High	Highly adaptable to potential changes in projected demand levels and operating conditions.
	Medium	Moderately adaptable to potential changes in projected demand levels and operating conditions.
	Low	Minimally adaptable to potential changes in projected demand levels and operating conditions.
ECONOMIC		
8. Minimize District Costs	High	Life cycle cost in low-cost group of strategies.
	Medium	Life cycle cost in moderate-cost group of strategies.
	Low	Life cycle cost in high-cost group of strategies.
9. Minimize Rate Impacts	High	Rate increases are small relative to other strategies.
	Medium	Rate increases are moderate relative to other strategies.
	Low	Rate increases are high relative to other strategies.
COMMUNITY		
10. Protect the Economic Well-Being of the County by Minimizing Costs to the Community	High	Enhances economic competitiveness and employment relative to current conditions.
	Medium	Maintains economic competitiveness and employment relative to current conditions.
	Low	Lowers economic competitiveness and employment relative to current conditions.
11. Include Public Involvement and Maximize Public Acceptance	High	Expect public will accept and endorse.
	Medium	Expect little public reaction.
	Low	Expect negative public reaction and resistance.
12. Maximize Opportunities for Recreation and Environmental Uses	High	Increases variety of recreational and environmental benefits in the County.
	Medium	Maintains current variety of recreational and environmental benefits in the County.
	Low	Decreases the variety of recreational and environmental benefits in the County.

TABLE 4-2
Rating Guidance For Planning Objectives
(continued)

OBJECTIVE	RATING	
13. Maximize the Quality and Treatability of Source Water	High	A high-quality source of water which can meet all existing or anticipated drinking water standards and aesthetic objectives with existing or currently planned treatment facilities. Treated potable water quality may be of higher quality than existing treated water quality. Source water of consistent high quality appropriate to its use.
	Medium	A moderate quality source of water. Source water can be treated to meet all existing and currently anticipated drinking water standards and aesthetic objectives at existing or planned facilities. Treated potable water quality is comparable to existing treated water quality. Source water quality fluctuates over a moderate range.
	Low	Source of water requires additional or specialized treatment to meet existing and anticipated drinking water standards and aesthetic objectives. Treated potable water quality is variable and may not be consistent with existing treated water quality. Source water quality fluctuates over a wide range.
14. Promote Efficient Water Use	High	Increases level of public outreach and education on conservation.
	Medium	Maintains current level of public outreach and education on conservation.
	Low	Reduces level of public outreach and education on conservation.
ENVIRONMENTAL		
15. Avoid or Minimize Adverse Impacts to Habitat or Ecosystems	High	Avoidance of, or minimal, non-significant impacts.
	Medium	Some significant impact, but can be mitigated to level of non-significance.
	Low	Significant impacts incurred that either cannot be mitigated or for which mitigation is problematic.

Round Two: Developing Hybrid Strategies

The lessons learned in the evaluation of the thematic strategies were used to develop the second group of resource strategies, called "hybrids" because they rely on a mix of components to accomplish specific planning objectives. The hybrid strategies are:

1. Minimize Environmental Impacts
2. Maximize Flexibility to Meet Changing Demands
3. Maximize Local Reliability
4. Minimize Costs

A complete discussion of the hybrid strategies development and evaluation appears in Chapter 9. Detailed evaluations of the thematic and hybrid strategies are contained in Appendices F and G, respectively. Economic analysis of the hybrid and preferred strategies and their potential impacts on District costs and water rates is contained in Appendix H.

Evaluation Overview

Evaluation of the thematic strategies was based on the original 13 planning objectives established by the Board, shown in Table 4-1.

During evaluation of the hybrid strategies two more objectives were added; the complete set of 15 planning objectives appears in Table 4-3. District staff identified six objectives (highlighted in Table 4-3) as the most suitable for evaluating hybrid strategies. (These six objectives used in the hybrid screening differed from those used for the screening of options and thematic strategies.) The other nine objectives were found to be less useful in discriminating between strategies because they resulted in nearly identical rankings. The six planning objectives used to evaluate the hybrid strategies were:

- Maximize Effective Use
- Maximize Ability to Respond to Changing Conditions
- Minimize Rate Impacts
- Maximize Public Acceptance
- Maximize the Quality and Treatability of Source Water
- Avoid or Minimize Adverse Impacts to Habitat or Ecosystems

TABLE 4-3
Matrix for Evaluation of IWRP Strategies

	Objective Categories*														
	Operational					Risk		Economic		Community					Env
	Equal Reliability	Maximize System Flexibility	Maximize Effective Use	Maximize MultiPurpose Potential	Meet Level of Service	Min. Risk of Providing Supplies	Max. Resp. to Changing Conditions	Minimize District Costs	Minimze Rate Impacts	Protect Econ. Well Being of County	Maximze Public Acceptance	Maximize Rec. & Env. Uses	Maximize Quality & Treatability	Promote Efficient Water Use	Minimize Impacts to Ecosystem
+															
H															
-															
+															
M															
-															
+															
L															
-															

* This matrix includes the Board's original 13 planning objectives plus two objectives added during evaluation of the hybrid strategies.

Step 4: Selecting the Preferred Strategy

After the evaluations of the hybrid strategies were summarized, District staff developed a preferred strategy that uses input from stakeholders and strives for balance across all planning objectives. The preferred strategy and its implementation are explained in detail in Chapters 10 and 11.

Chapter 5
PROJECT NEED AND POTENTIAL SHORTAGES

This chapter establishes the need for the IWRP project from a water supply perspective. It explains the District's methodology for projecting water demand, characterizes the District's local and imported water supplies, and describes how the District arrived at a forecast of potential shortages. Uncertainties and risks are associated with any projections; those specific to the water supply planning process are discussed in the final section of the chapter.

Background

Water supply planning has become an increasingly complex undertaking. This complexity is a result of increased environmental concerns, expanding water conservation efforts, growing costs for developing new supply, changing water quality regulations and political and institutional constraints, and changing public perception about the role of water supply agencies. To account for these conditions and uncertainties in the District's future operating environment, the District has elected to plan for a demand range and to use baseline conditions to anticipate future programs and policies. These terms are explained below.

Planning for a Demand Range

The use of a demand range (as opposed to a single demand projection line) acknowledges that many of the factors that drive water demand are difficult to predict and not within the District's control. Planning for a demand range ensures that the water supply resource strategies developed will be flexible and able to be refined over time as assumptions about the future are compared to actual conditions.

The use of a demand range acknowledges that many of the factors that drive water demand, such as water use patterns and growth, are difficult to predict. Earlier this decade, Santa Clara County experienced both drought and economic recession. The long-term effects of these events on water use is uncertain. In addition, future environmental needs and groundwater clean-up efforts are hard to anticipate. Planning for a demand range acknowledges these uncertainties and ensures that the water resource strategies developed will be flexible and able to be refined over time as assumptions about the future are compared to actual conditions.

Baseline Condition

The baseline condition describes a projection of the future given current programs and policies. It is not a true no-action alternative in that it includes projects currently in design and construction and some projects in the planning phase (those that are clearly defined and deemed to have a high probability of implementation). For example, baseline water conservation is not derived from current water savings, but rather from the water savings expected in the future given the implementation of water conservation programs that have been or are expected to be adopted. In other words, the baseline projection is an estimate of what will occur, given present understanding.

Water Demand

Influences on Water Use

The most apparent influences on water demand are water use patterns and growth. As the population and industries grow in a region, water use increases.

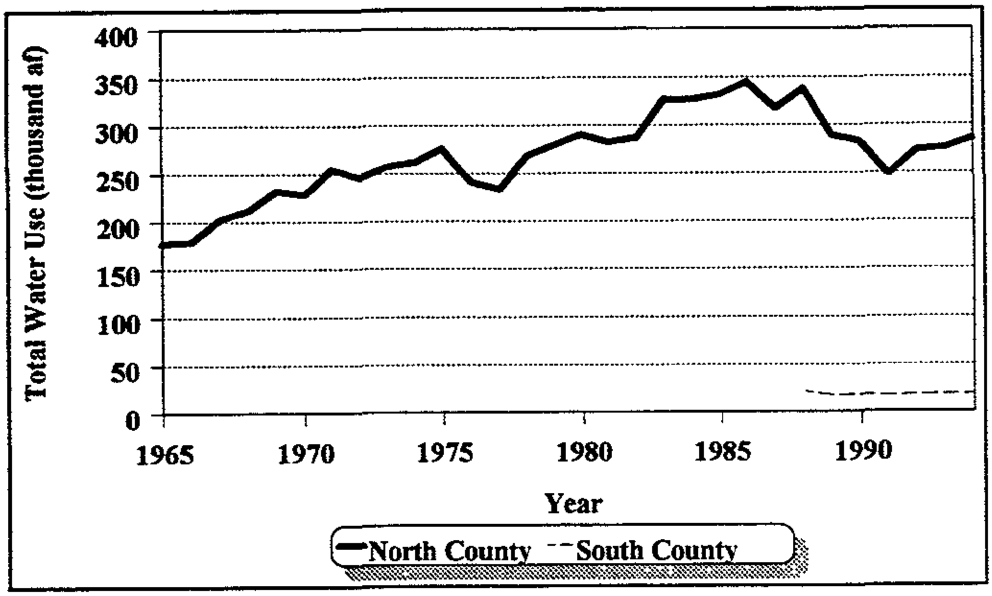
Changes in the way people use water are often gradual and hard to quantify. For example, changes in the efficiency or number of water-using appliances and fixtures, the popularity of backyard swimming pools, or the acceptance of low-water-use alternatives to the traditional (but water-hungry) lawn can significantly alter water demand trends. Groundwater cleanup efforts can be very water-intensive, increasing water use significantly during their duration. In addition, weather conditions such as temperature and rainfall have a pronounced effect on outdoor water use.

Historic Water Use

Santa Clara County ranks fourth in the state in terms of population and jobs. Its industries provide more than 6 percent of the state's employment with a gross regional product of more than $40 billion annually. M&I water demand, which includes residential, commercial, and industrial water use, has grown as a result of urbanization. Conversely, agricultural water demand has declined as irrigated agricultural land has been converted to other uses. Environmental demands, such as water required to meet downstream fishery needs, have been minimal in the past, but may become more significant in the future.

The District has been recording water use in North County since 1964, but its records for South County water usage are relatively short, beginning in July 1987. For the North County, water use has varied from a low of about 175,000 af in 1965 to a high of about 330,000 af in 1988. The South County M&I water usage is approximately 20,000 af. Figure 5-1 shows the M&I water use for both areas of the County over a 25-year period. Total historical water use Countywide reached approximately 400,000 af in 1987 as shown in Figure 5-2.

FIGURE 5-1
Historical Municipal and Industrial Water Use in Santa Clara County



The most dramatic variations in Figure 5-1 are the drops in use during the droughts of 1976-1977 and 1987-1992. Due to supply limitations, either voluntary or mandatory use reduction measures were enacted in these years. After a drought ends, as people replace lost landscape and return to previous water use habits, water demands may return to previous levels. The years after the 1977 drought show this effect. The rebound from the most recent drought is more complicated. First, given its multi-year duration, there is some indication that some of the water use changes made during the drought have led to permanent water savings. Second, the drought coincided with an economic recession in the region. As industries cut back on production due to the recession, their water use decreased as well. To some degree, the timing of the water demand rebound from this most recent drought is tied to the economic recovery of the County.

The Demand Range

The demand range used for planning purposes for the IWRP project is illustrated in Figure 5-2 and Table 5-1. The demand range was defined broadly to minimize the possibility that the actual future water use could fall outside the band. The likelihood that future demands will lie within the band is extremely high.

FIGURE 5-2
The District's Demand Range for Planning

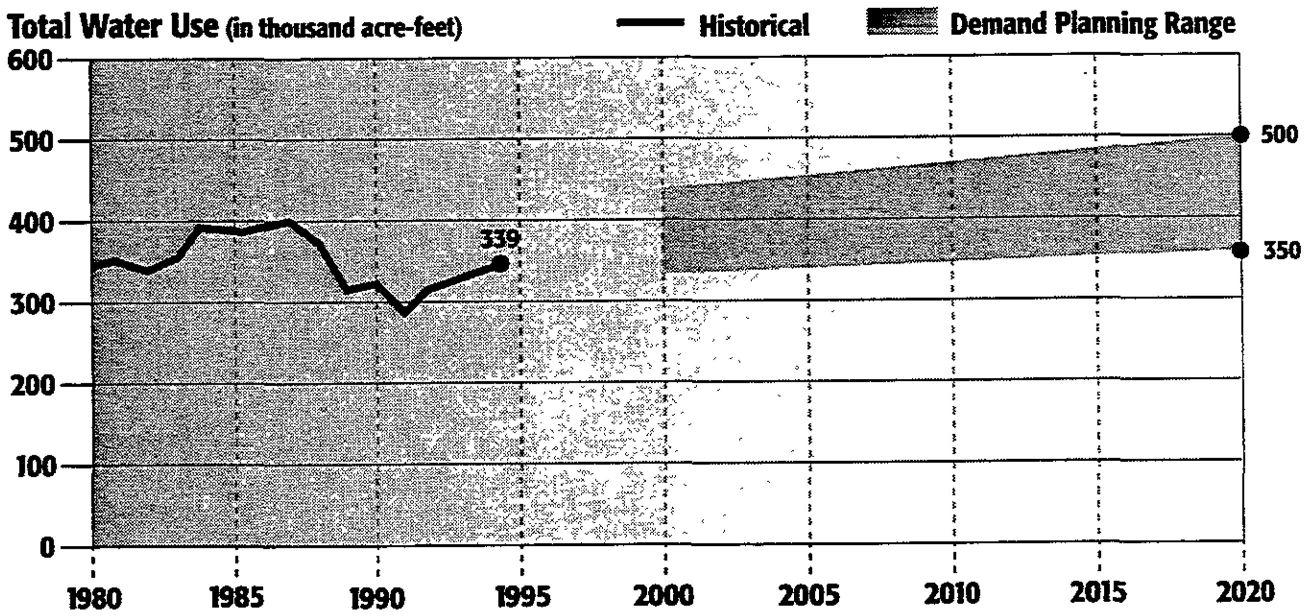


TABLE 5-1
The District's Demand Range for Planning
(thousand af/year)

Year	2000	2005	2010	2015	2020
Lower Limit	325	336	343	345	350
Upper Limit	446	454	466	479	500

The demand range takes into account the demographic changes and water conservation savings expected in the County through the planning horizon of year 2020. The demand range is bounded by two different visions of future water use behaviors. These alternate views of the future, as well as the assumptions inherent in the demand range, are described below.

Demographic Changes. The demand range was derived using demographic projections from the Association of Bay Area Governments (ABAG) Projections 90. These demographic projections are based on extensive regional economic and demographic analyses, local development policies, and extensive local participation and review. Projection 90 included projections through year 2005; demographic data for years 2010 through 2020 were extrapolated by District staff from the Projections 90 data, then adjusted to reflect local planning department review. Demographic projections for Santa Clara County are summarized in Table 5-2.

Water Conservation. The demand range includes both passive and active conservation. Passive conservation describes those water savings that happen regardless of any action on the District's part. Although the District is not responsible for passive conservation, it is important to estimate and account for such water savings to ensure that the projected water demand does not overestimate the water need that will occur. Changes to the California plumbing code that limit sales of new toilets and showerheads to water-conserving models are considered in the demand forecast. It is estimated that this passive conservation lowers the year 2020 water demand by 28,000 af/year.

Active conservation results from implementation of District water conservation programs. The District's existing demand-side management (DSM) programs, including the Water Conservation BMPs, the CVPIA conservation requirements, and the tumble-action washing machine rebate program, are expected to save 46,100 af/year by year 2020. These programs are described in Chapter 7.

The water demand analysis was performed in 1992 before ABAG's Projections 92 was available. The analysis was not updated after the release of ABAG Projections 92 or ABAG Projections 94 because it was felt the demographics were highly subject to change due to the economic recession affecting the County at that time. ABAG Projections 96 data by census tract have just recently become available, and will be used in 1997 to update the District's water demand projections. However, preliminary analysis indicates that if the District's water demand projections were to be updated, the resulting demand projections would still fall within the demand planning range.

Agricultural Water Use Projections. The agricultural projection reflected in the demand range was derived in two parts: North County and South County agricultural water use.

Only small pockets of agricultural land remain in the northern portion of the County. A regression analysis of agricultural water use in this zone and agricultural jobs identified a close correlation between the two, so this relationship and agricultural jobs as projected by ABAG were used to project agricultural water use.

TABLE 5-2
Demographic Projections for Santa Clara County

	1990[1]	2005[2]	2020[2]
Population	1,463,600	1,658,100	1,788,600
Households	525,900	617,490	687,200
Jobs	881,710	1,145,950	1,334,800

[1] From ABAG projections
[2] District projections

The southern portion of the County is more rural than the north, and the majority of water use is agricultural. Because of the limited data record and the importance of agricultural water use in this zone, a more rigorous analysis was performed. The base acreage of irrigated land was estimated using land cover maps developed by Department of Water Resources (DWR) and checked against aerial photographs of the area. The conversion of agricultural land to other uses, as indicated by the general plans for the cities of San Jose, Gilroy, and Morgan Hill was accounted for in the projections of future agricultural acreage. An average per-acre water use of 1.8 af/year/acre was used to project future water use, based on analysis of actual water use per acre by crop for the zone and the cropping patterns characteristic of the zone.

Environmental Demands. Environmental demands considered for the baseline projection are minor. Currently, a 1 cubic feet per second (cfs) fish flow is maintained on the Guadalupe River at gage 23B, above Almaden Expressway. The environmental requirements below Uvas Reservoir also serve as groundwater recharge, and as such have minimal impact on District operations.

Groundwater Remediation Demands. Large groundwater cleanup projects can be very water-intensive. In the past, groundwater pumping in Santa Clara as part of cleanup efforts has exceeded 15,000 af/year in some years, although such pumping has declined. Current projects use less than 1,000 af/year. The baseline demand projection assumes future groundwater cleanup water use will be negligible.

Lower Limit. The M&I component of the lower limit of the demand range is based on 1991 water use and population projections. By using 1991 water use data, a year significantly impacted by the recent drought and economic recession, the projection is equivalent to assuming a continuation of the drought demand reduction measures and recession employment-to-population ratios. The 1991 per capita water use for North County was 155 gallons per capita per day (gpcd). By 1994, the per capita water use had grown to 172 gpcd.

Upper Limit. The M&I component of the upper limit of the demand range was derived using local water use records from the early 1980s. These are pre-drought water use data, therefore the projection assumes a return to pre-drought water use behaviors. The projection was then adjusted for savings from conservation programs and water-efficient device sales due to plumbing code changes. The projected employment data are pre-recession data, therefore the projection assumes a return to pre-recession visions for the local economy and manufacturing character.

The residential water demand was forecasted using the U.S. Army Corps of Engineers water demand forecasting model, IWR-MAIN. For single-family households, the water use ranged from 292 to 453 gallons per household per day (before accounting for conservation savings). Multi-family water use was lower, ranging from 254 to 349 gallons per household per day.

For the commercial/industrial sectors, a per-employee water use coefficient of 135 gallons per day was used. The projected commercial/industrial water demand was computed based on this coefficient and the projected number of employees.

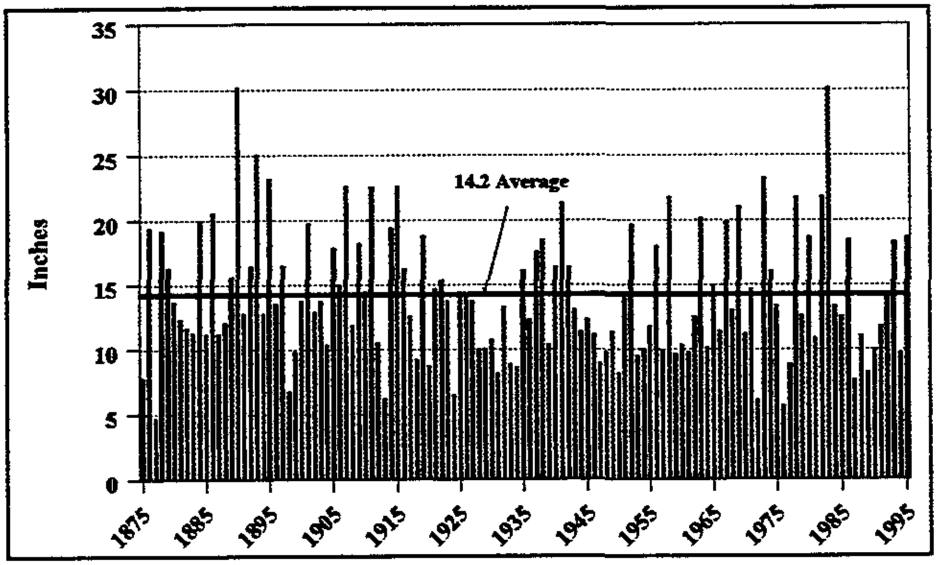
Retail water use includes water supplied that is otherwise unaccounted for (either losses in the system, metering errors, or unmetered uses). Eight percent of the total water delivered is unaccounted for.

Water Supplies

California is a semi-arid area with 70 percent of all precipitation occurring between the months of December and March. Water supply for the County is a function of the amount of precipitation that falls both locally and in the watersheds of the Sierra Nevada. From the 121 years of recorded rainfall in the County, the average annual rainfall in downtown San Jose is about 14 inches and ranges from a low of 4.8 inches to a high of more than 30 inches.

Figure 5-3 shows the variability in historical rainfall that has occurred in downtown San Jose. During very wet years like 1983, in which 30.25 inches of rain fell and generated more water supply than could be put to beneficial use, the excess water created flooding throughout the County. But in very dry years such as 1976, when only 5.77 inches of rain fell, the water supply generated was extremely low and produced drought conditions.

FIGURE 5-3
Historical Rainfall, Measured in Downtown San Jose



Characterizing Hydrologic Supplies

The water supply that will occur in any one year is unknown. To address these variations, supplies are typically characterized under a variety of hydrologic conditions as defined by the historical record. Water supplies are described under three conditions: the wet year (Wet) supply, the long-term average (LTA) supply, and the critical dry period (CDP) supply.

Beneficial yield is the amount of water that can be controlled and put to use for water supply purposes.

One important consideration in water supply planning is the concept of beneficial yield. Beneficial yield means the amount of water that can be controlled and put to use for water supply purposes. For surface water, this means the surface flow that can be diverted to a reservoir, water treatment plant, or groundwater recharge facility. For groundwater supplies, beneficial yield recharges the groundwater basin from direct precipitation, net leakages from pipelines, irrigation return flows, and subsurface inflows from adjacent areas. Thus, the beneficial supply available is a function of the facilities in place to develop the supply.

Wet Supply. The Wet supply is defined as the maximum beneficial supply available during the historic record, equivalent to that experienced in 1983. In the case of local supplies, this will be the maximum yield that can be developed by existing facilities. In the case of imported supplies, it will be the maximum entitlement under the contract.

Long-Term Average Supply. The LTA supply is defined as the average supply available over the historic hydrologic record, given existing facilities. For imported supplies, this is the average supply the District could expect with the existing supply facilities and contractual demands over the historical hydrology from 1922 through 1990, with current environmental regulations in place. This is not the same as the average of the District's actual past water deliveries from these sources. What is of interest is what the District would have available if the historical hydrology were to recur, not what the District actually received in the past.

Critical Dry Period Supply. Common practice in water supply planning is to plan for the dry periods that have historically been observed. Five dry periods have occurred in the County since 1920; these events have ranged in duration from 2 to 7 years. The longest/most severe of these for the storage capacity of the District's system is the 1927-1934 dry period, which represents the CDP used as the design event in the IWRP.

Local Supplies

The County's local water supply comes from rainfall and the ensuing surface water runoff and natural groundwater yield. Identifying historical availability of these resources allows the District to develop forecasts about how much local water yield can be expected under various hydrological conditions. To determine how much surface water has historically been available, the District relies on records of rainfall, surface flow, pumping, and artificial recharge; these, in turn, are used to calculate annual groundwater yield.

The hydrologic data available for the County is limited. While there are 121 years of continuous rainfall data at one site in San Jose, most of the streamflow and reservoir inflow data dates only as far back as the 1930s or 1940s, and records for some streams and reservoirs begin as late as 1962.

Surface Water Yield. The District's local surface water supplies include the stream flows that feed into and out of the District's reservoirs, stream flows that are not captured by reservoirs, and water that flows overland into reservoirs. The average surface flow in the County, based on the hydrologic data for the period 1967 to 1991, is about 193,700 af/year. On average, less than half of this water supply, or 91,000 af/year, can be captured and put to beneficial use through surface diversions or groundwater recharge. During a dry period, the surface water flow and the yield are approximately the same; that is, no water is lost to either the San Francisco or Monterey bays. The yield averages only 54,000 af/year during a dry year. The maximum flow the District's system can put to beneficial use is about 140,000 af/year.

This shortfall on the LTA yield is due in part to the capacity limits of the District's storage, recharge, and conveyance facilities. Some dams and reservoirs are not large enough to capture all of the reservoir inflows that could be put to beneficial yield. If a reservoir spills frequently, much of the flow that could have been developed into yield will instead flow to the Bay, or the yield of a stream system might be limited due to the downstream recharge capacity. If stream flows are much higher than the recharge capacity, much of the flow will not be developed into water supply yield. If more recharge capacity could be developed on these streams, then more of the available local streamflow could be recharged into the groundwater basin.

A comparison of the District's local surface water flows and yields is shown in Table 5-3 by stream type. The first, unregulated streams, do not flow into or out of a reservoir. The next component, regulated streams, include reservoir inflow, which flows from creeks and over land into a reservoir, and downstream accretions, which enter a regulated stream downstream of a dam. Although regulated streams have an average yield of 49 percent, three of these (Stevens, Alamitos, and Uvas creeks) are well below that and have the potential for greater yield.

TABLE 5-3
Historical Surface Water Supply in Santa Clara County

Facility	Avg. Surface Flow (af/year)	Avg. Local Yield (af/year)	Yield as Percent of Surface Flow
UNREGULATED STREAMS			
Regnart Creek	200	100	0%
Calabazas Creek	700	500	71%
Rodeo Creek	30	30	100%
Saratoga Creek	6,100	1,900	31%
Wildcat Creek	1,500	200	13%
San Tomas Creek	1,600	300	19%
Ross Creek	900	700	78%
Penitencia Creek	4,300	900	21%
Thompson Creek	900	400	44%
Silver Creek	1,600	500	31%
SUBTOTAL	**17,800**	**5,500**	**31%**
REGULATED STREAMS			
Stevens Creek Total		3,300	32%
Reservoir Inflow	10,400		
Los Gatos Creek Total		16,600	74%
Reservoir Inflow	21,900		
Downstream Accretions	400		
Guadalupe River Total		5,500	60%
Reservoir Inflow	4,900		
Downstream Accretions	4,200		
Alamitos Creek Total		4,400	38%
Reservoir Inflow	10,900		
Downstream Accretions	800		
Calero Creek Total		4,000	54%
Reservoir Inflow	4,200		
Downstream Accretions	3,200		
Coyote Creek Total		34,700	65%
Reservoir Inflow (Coyote)	31,900		
Reservoir Inflow (Anderson)	21,100		
Llagas Creek Total		9,000	87%
Reservoir Total	10,400		
Uvas Creek Total		8,000	16%
Reservoir Total	27,100		
Downstream Accretions	24,500		
SUBTOTAL	**175,900**	**85,500**	**49%**
TOTAL SURFACE SUPPLY (af/year)	**193,700**	**91,000**	**47%**

Natural Groundwater Recharge. Recharge to the groundwater basin consists of both natural groundwater recharge and artificial recharge of local surface and imported water. Natural groundwater recharge includes recharge from rainfall, net leakage from pipelines, seepage from the surrounding hills, seepage into and out of the groundwater basin, and net irrigation return flows to the basin. Estimates of the natural groundwater recharge for these three subbasins are shown in Table 5-4. Artificial recharge is not shown since that water has already been accounted for as either local surface supply or imported water supply.

TABLE 5-4
Natural Groundwater Recharge in Santa Clara County
(thousands of af/year)

	Santa Clara Subbasin	Coyote Subbasin	Llagas Subbasin	Total
Wet	126	10	89	225
LTA	62.9	4.9	44.3	112.1
CDP	41.4	3.2	29.1	73.7

Non-District Local Supplies. Other agencies also develop water locally. The San Jose Water Company and Stanford University both hold surface water rights. Stanford's local water development is small. San Jose Water Company, however, has developed an average yield of 9,500 af/year of water from a run-of-the-river treatment facility on Saratoga Creek and from Elsman Reservoir in the Los Gatos Creek watershed. These local projects are reflected in the local surface water yields listed in Table 5-3 above.

Recycled Water. Recycled water is a local source that is being developed by the four water pollution control plants (WPCP). Since recycled water is developed from wastewater flows, its yield is not dependent on hydrologic conditions. The yields are available in all years, even during the CDP.

The recycled water use included in the baseline projection includes the following current and planned projects for a total of 14,400 af/year recycled water use:

San Jose/Santa Clara Phase I	9,000 af
Sunnyvale Phase I	2,400 af
Palo Alto	400 af
Gilroy	2,600 af

These projects, and their additional potential, are described in Chapter 6.

Imported Supplies

The County receives imported water from San Francisco Water Department's (SFWD) Hetch-Hetchy system, the SWP, and the federal CVP. A map of these water projects is shown as Figure 5-4.

Hetch-Hetchy. Several of the municipalities in the County have contracts with the City and County of San Francisco for water from the Hetch-Hetchy project. Hetch-Hetchy imported deliveries originate in the Tuolumne River watershed high in the Sierra Nevada mountains and are transported directly by closed conduit to the Bay Area. The District does not control or administer Hetch-Hetchy deliveries to the County; however, this supply reduces the demands on District-supplied water.

The contracts under which the agencies in the County receive water from the Hetch-Hetchy system are defined as either interruptible or noninterruptible. The cities of San Jose and Santa Clara have interruptible contracts; the other agencies all have noninterruptible contracts. During dry periods, deliveries to all contractors can be reduced. The deliveries to Santa Clara and San Jose, however, can be discontinued entirely at the discretion of SFWD.

The baseline projection assumes that the interruptible contracts will not be discontinued. Given this assumption, the Hetch-Hetchy deliveries to the County under average conditions are expected to be approximately 63,800 af/year. As little as 52,900 af/year is assumed available in dry years, and the maximum delivery expected is 76,000 af/year. The baseline delivery projections are estimated based on historical usage.

The State Water Project. The District has a water contract for 100,000 af/year from the SWP, delivered via the Banks pumping plant in the southern Delta and the South Bay Aqueduct (SBA). Currently, the SWP has developed only about half of the firm yield required to meet the current and future quantity of water that the project has contracted to deliver.

DWR has been investigating several projects to help meet its commitments in the future: conveyance improvements in the Delta, water banking in the groundwater basin in Kern County, and a new reservoir at the Los Banos Grande site. The future of all of these projects is currently unknown. Therefore, the availability of water from the SWP is based on current system components: Delta improvements and additional storage facilities are not considered.

The Central Valley Project. The District's imported CVP deliveries originate from the Tracy pumping plant located in the Southern Delta through the Delta Mendota Canal to San Luis Reservoir and through the San Felipe Project into Santa Clara County. The project is contracted to deliver 152,500 af/year (130,000 af/year for M&I needs and 22,500 af/year for agricultural needs).

Factors That Affect the Availability of Imported Water Supplies

In addition to hydrologic variability, a number of factors influence the availability of the County's imported water sources. These are described below and in Appendix I.

The SWP and CVP are subject to state and federal regulations for protection of environmental water quality and fish and wildlife resources of the Delta and upstream watersheds. Deliveries from the Delta are currently restricted under the SWRCB's water quality standards, the ESA requirements to accommodate the winter-run salmon and Delta smelt, and the CVPIA requirements.

Bay-Delta Issues. In the December 1994 Delta Accord, the state and federal resource agencies, together with water users and the environmental community, agreed on a package of flow, operational and nonflow requirements for the San Francisco Bay/San Joaquin-Sacramento River Delta Estuary (Bay-Delta) as part of a comprehensive plan to restore the ecosystem health of the estuary. This Accord is a 3-year agreement to coincide with the SWRCB's triennial review process on water quality standards. During this interim 3-year period, the SWP and CVP agreed to meet the flow and operational requirements contained in the Accord until the SWRCB completes the water rights process to allocate flow responsibilities within the water user community.

As part of the Accord, the resource agencies agreed to avoid additional ESA listings for 3 years. In the event that additional listings are required due to unforeseen circumstances, it is understood that ESA actions shall result in no additional water cost. Additional water needs will be provided by the federal government on a willing-seller basis financed by federal funds, not through additional regulatory reallocations of water within the Bay-Delta. In addition, all CVP water provided pursuant to the Accord shall be credited toward the CVP obligation under the CVPIA to provide 800,000 af of project yield for specified purposes.

The SWRCB published the new Water Quality Control Plan (Plan) for the Bay-Delta in May 1995. The water quality standards contained in the Plan are very similar to those contained in the Delta Accord. The SWRCB is currently conducting the scoping phase of the water rights implementation process with the objective of adopting a methodology to allocate flow responsibilities among diverters of the Bay-Delta watersheds. If the SWRCB adopts a methodology that allocates flow responsibilities to other water users in addition to users of the SWP and CVP, then contractors of the SWP and CVP may see a reduction in flow impacts that are now completely borne by the two water projects.

While the SWRCB water rights process is underway, a parallel process of negotiations to reach settlement on flow responsibilities is ongoing. Export water users of the SWP and CVP have been negotiating with upstream water users along the Sacramento and San Joaquin Rivers to see how the flow (and some operational) responsibilities can be shared among the upstream and export water users. If settlements can be reached and the upstream users agreed to provide part of the flow to meet the 1995 Plan, the flow impacts to export SWP and CVP users may be reduced.

As part of the framework agreement leading up to the Delta Accord, the federal and state governments established a California/Federal (CALFED) process to seek a long-term solution to the Bay-Delta problems. The CALFED Bay-Delta Program was established in May 1995 to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The Program is intended to complement environmental protection actions under the SWRCB process of implementing water quality standards and provide a long-term, durable solution.

The success of the CALFED Bay-Delta Program is the key to availability of imported water to the District. Since all of the District's SWP and CVP water is conveyed through the Delta, "fixing" the problems of the Delta is the critical element of improving the reliability of the District's imported supplies. In addition, a Delta "fix" will improve the District's ability to secure additional imported water through transfers or banking arrangements. Furthermore, certain alternatives in the CALFED Bay-Delta Program may provide improvements in source water quality that may enhance the District's ability to meet future, more stringent drinking water quality standards, and reduce the District's long-term treatment costs.

Monterey Agreement. For a number of years, the agricultural and M&I contractors of the SWP had been in dispute relating to the shortage provisions of Article 18 of the

SWP contracts. In August of 1994, it was agreed by all that the Article 18 issues needed to be resolved in order to avoid potential litigation among contractors and potential disagreements regarding SWP water allocation in the coming years.

In December 1994, the SWP contractors reached an agreement, the "Monterey Agreement," to resolve disputes regarding water allocation and changes in the operational and financial control of the SWP. The major principles of this agreement resulted in the following:

- SWP Agricultural (Ag) contractors will transfer 45,000 af of water entitlements to DWR.
- SWP Ag contractors will make available for permanent transfer to Urban Contractors, on a willing buyer/willing seller basis, 130,000 af of annual entitlements. The District is considering purchasing about 20,000 af of the 130,000 af.
- All SWP contractors (Ag and M&I) will now share equally any cutbacks that may be imposed on the SWP.

Upon the completion of the Monterey Agreement, the SWP Contractors and DWR spent most of 1995 developing an implementation plan. A program EIR was completed and certified by the Central Coast Water Authority, the designated lead agency, on October 26, 1995. Subsequent to the EIR certification, the SWP contractors signed appropriate amendments to their long-term SWP Water Supply Contracts to implement the Monterey Agreement. By December of 1996, 24 of the 29 long-term contractors had signed contract amendments. These 24 contractors represented more than 95 percent of the SWP Entitlements. A few other contractors are still considering signing appropriate amendments.

Central Valley Project Improvement Act. In October 1992, federal legislation was enacted which substantially changed the operation and administration of the CVP. This legislation, CVPIA, dedicates 800,000 af/year to restore anadromous fish production in Central Valley rivers and streams, and to assist in meeting the CVP's post-1992 obligations under ESA and Bay Delta water quality standards. The CVPIA also dedicates over 200,000 af to Central Valley wildlife refuges and over 340,000 af to maintain flows in the Trinity River.

Central Valley Project Municipal and Industrial Preference Policies. The District's CVP contract allows the Secretary of the Interior substantial discretion in applying shortages to both agricultural and M&I supplies. In recent years, this discretion has been exercised under an interim policy to provide minimum deliveries of M&I water equal to 75 percent of "historic use," which is defined as average deliveries of CVP M&I water during the last 3 normal water years. The District is currently working with the U.S. Bureau of Reclamation (USBR) to finalize this policy, and at the same time is pursuing federal legislation which would provide statutory support. Finally, because a CVP M&I shortage policy based on historic use results in some operational constraints, the District is also negotiating an agreement with other CVP contractors which would change the basis of shortage deliveries from 75 percent of "historic use" to 75 percent of M&I contract quantity. Once these negotiations are completed, the District's minimum CVP M&I delivery will be established at 97,500 af.

Based on DWR studies of the water delivery impacts of the regulatory actions described above, the imported water available to the District is shown in Table 5-5. This imported water availability used for the baseline projection reflects current understanding of the impacts of the CVPIA, the Monterey Agreement for the SWP, and successful negotiation for a CVP M&I preference equivalent to a delivery floor of 75 percent of M&I entitlement. The baseline projection also assumes the provisions of the December 15, 1994, Bay-Delta Accord, a 3-year agreement, are extended indefinitely either through subsequent agreements or the SWRCB's Water Quality Control Plan, and that the responsibility for meeting the provisions of the Accord will continue to be borne by the SWP and the CVP and not shared among other water users. No potential new Delta facilities or operational modifications are reflected in the baseline projections.

TABLE 5-5
Imported Water Available to the District
(in af)

	SWP	CVP	Total
Wet	100,000	152,500	252,000
LTA	74,000	125,000	199,000
CDP	47,000	110,000	157,000

Water Shortages

Table 5-6 summarizes the water supplies available under baseline projection for the three different hydrologic conditions considered. The water supplies in the table reflect a reduction in groundwater storage of 40,000 acre-feet per year on average during the CDP. Based on the County's projected water need and water supply, Table 5-6 presents the projected water shortages for the years 2000, 2010, and 2020.

TABLE 5-6
Santa Clara County Water Supply
(average values for the hydrological period in af/year)

		Wet	LTA	CDP
Local Supplies	Surface Water Yield[1]	155,000	101,000	59,000
	Natural Groundwater Recharge	225,000	112,000	74,000
	Recycled Water	14,400	14,400	14,400
	Drawn out of Local Storage	0	0	40,000
Imported Supplies	SWP	100,000	74,000	47,000
	CVP With M&I Preference	152,500	125,000	110,000
	Hetch-Hetchy	76,000	63,800[2]	52,900[2]
	Total	**722,900**	**490,200**	**397,300**

[1] Includes Stanford and San Jose Water Company supplies
[2] Estimate based on historical usage

TABLE 5-7
Santa Clara County Projected Water Shortage
(thousand af/year)

	Year 2000		Year 2010		Year 2020	
	Lower Demand	Upper Demand	Lower Demand	Upper Demand	Lower Demand	Upper Demand
Wet	0	0	0	0	0	0
LTA	0	0	0	0	0	10
CDP	0	49	0	69	0	103

As shown in Table 5-7, the District's current water supplies are expected to be sufficient to meet the County's needs through the year 2020 under average hydrologic conditions. During the CDP, however, the County could be short from 49,000 to 103,000 af/year of water, depending on the demand experienced. Since the CDP supply includes the full use of the operational storage in the groundwater basins, the CDP shortfall must be met by additional water supplies or through mandatory demand reduction measures if ground subsidence is to be avoided.

Does this mean the District has no need for additional supplies, other than in a distant CDP? Not necessarily. Figure 5-5 shows the water shortage that can be expected with the historical hydrologic record and a year 2020 water demand of 500,000 af/year. Figure 5-6 shows the cumulative probability of shortage for different levels of demand. These figures show what shortages would occur if no measures are taken during years when supply is less than demand. The demand is met by drawing down the groundwater storage to the level at which additional decreases in storage would result in ground subsidence. At that point, demands that exceed supply go unmet. Operating in such a manner would result in large shortages in the latter years of a drought, as is indicated by the figures.

Risks to the Baseline Projection Assumptions

The analysis above is based on an understanding of the conditions that influence the County's water supply and demand. The climatic, regulatory, and political forces which shape the availability of water throughout California are numerous and ever-changing, making it difficult to accurately forecast the availability and reliability of future water supplies. In addition, system vulnerabilities and operational uncertainties may also impact the baseline projection.

During the discussion of planning objective "Minimize Risk of Providing Supplies" in Chapter 3, ten general categories of risk were identified. Examples of risks in each of these categories that potentially impact the baseline projection are described below.

Hydrologic Uncertainties

Hydrologic uncertainties influence the projections of both local and imported water supplies. The analysis of shortage is based on the annual fluctuations found in historically observed hydrology. However, from a climatic sense, the observed hydrologic record is short. Major cycles, such as the extended

FIGURE 5-5
Water Shortage in Santa Clara County
(by year)

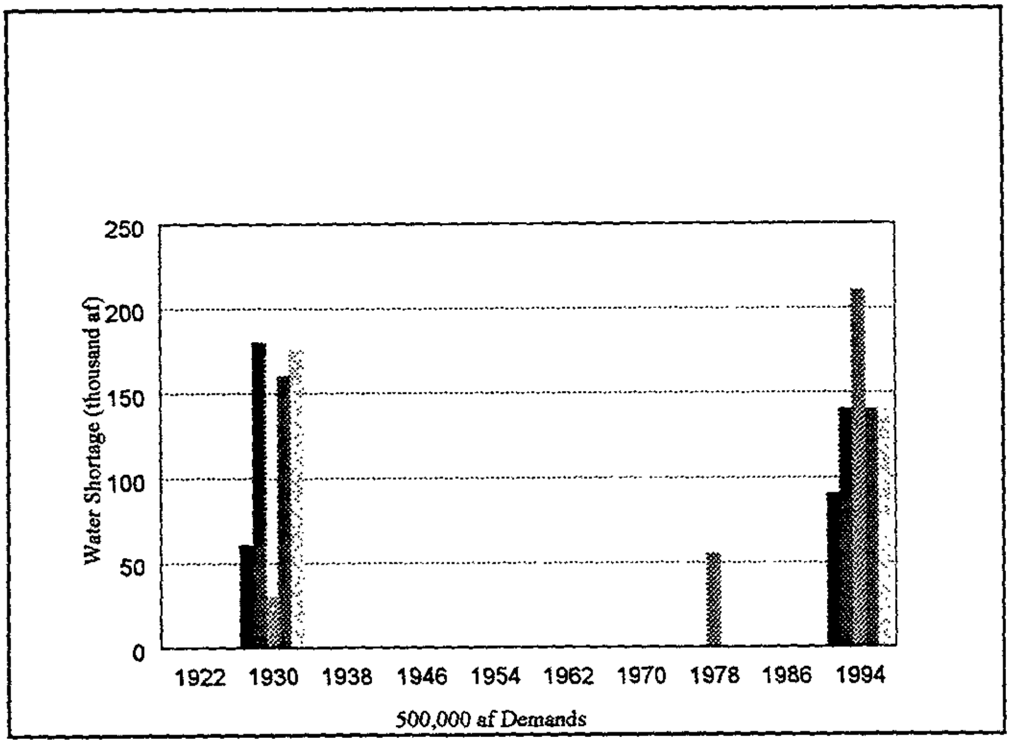
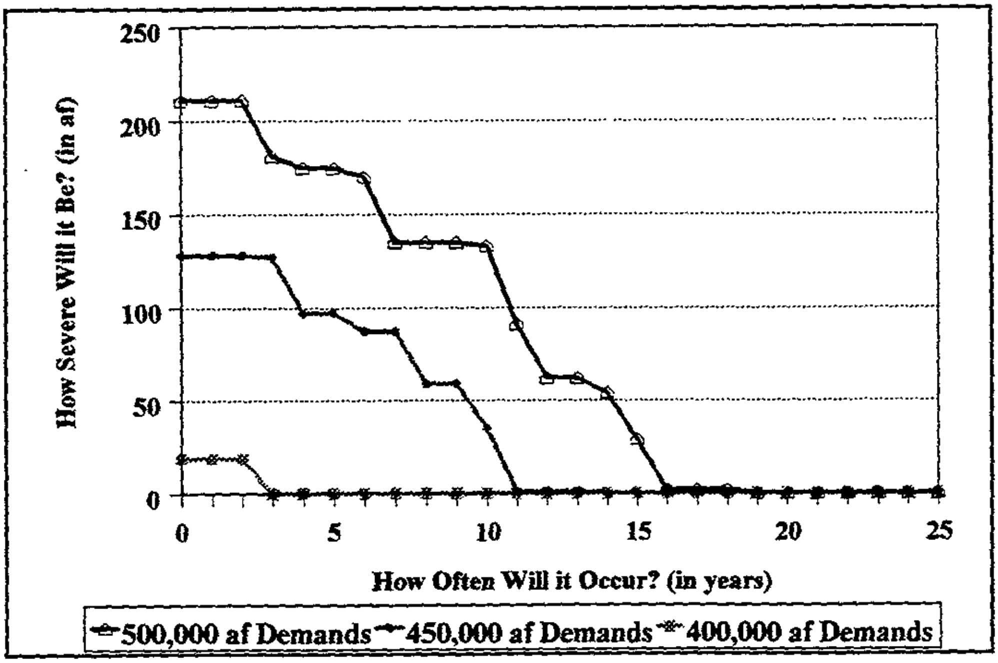


FIGURE 5-6
Cumulative Probability of Water Shortage in Santa Clara County
for Different Levels of Demand



wet and dry periods of the previous centuries, and potential long-term changes, such as global warming, are not considered.

There is a risk that more severe drought events than have been historically observed may be experienced in the future. Even if the magnitude of annual precipitation were to remain the same as in the past, changes in the timing or form of that precipitation could have serious ramifications from a supply standpoint. For example, if global warming were to shift the precipitation in the Sierras from winter snowfall to rains, some of the storage capability of the snowpack would be lost, and yields to the SWP, CVP, and Hetch-Hetchy systems would be reduced.

The likelihood of such risks are unknown. The impact on the District's ability to meet County water needs if such events were to occur could be significant. It is important when evaluating alternatives to remember that the CDP is a design event selected given today's understanding, and it is not necessarily an event that will occur in the future or even the worst event that may occur in the future.

Regulatory Actions

Regulatory actions that can impact local or imported supplies include potential additional listings under the federal and state ESAs, Congressional mandates such as the CVPIA and the Safe Drinking Water Act, and SWRCB water rights decisions (especially in the Bay-Delta area). The category of risk includes a number of potentially serious impacts to District water supply reliability.

The listings of the winter run Chinook salmon and the Delta smelt under the ESA have already had significant impacts on SWP and CVP pumping from the Delta. However, under the December 1994 Bay-Delta Accord, there will be no additional listings and no additional flow impacts to water users for a 3-year period.

The responsibility for meeting Bay-Delta standards is currently being borne by the two major water projects, the SWP and the CVP. Other water diverters that impact the Delta may ultimately share some of this responsibility, resulting in a yet-to-be-defined reduction of flow responsibilities to the SWP and CVP. In the baseline projection, it is assumed that the SWP and CVP will continue to bear the burden of the 1995 Water Quality Control Plan, i.e., an indefinite extension of the December 15 Bay-Delta Accord.

The Hetch-Hetchy system also faces regulatory uncertainty. SFWD has recently reached an agreement with the Federal Energy Regulatory Commission for environmental releases on the Tuolumne River. The impact of this agreement on deliveries to SFWD's suburban contractors is unknown at this time.

Even local supplies are subject to regulatory uncertainty. The District is currently meeting a minimum fish flow requirement on the Guadalupe River as part of an agreement with the California Department of Fish and Game. The District's ability to use gravel spreader dams in local streams as part of its groundwater recharge program is also currently under discussion.

The baseline projection is based on the December Accord, which is a 3-year agreement. Changes to Bay-Delta standards are a virtual certainty, but the shape of those changes is unknown at this time.

Institutional and Political Uncertainties

Institutional and political uncertainties are risks due to changing institutional structures or political climates. In part, the CVPIA could be considered a result of changing political climates at the federal level. Uncertainty over the implementation of the CVPIA remains, especially regarding the 800,000 af/year of yield from the CVP that has been designated for environmental purposes and flow requirements of the Anadromous Fish Recovery Plan currently under development. How the CVPIA is interpreted with respect to Delta outflow requirements and other Bay-Delta requirements is still under discussion.

A future institutional uncertainty is the potential for change of ownership of the CVP. Discussions are underway for a possible buyout of this federally-owned project by its agricultural contractors. Agricultural ownership could have significant impact on the District, especially with regards to M&I preference policies that are crucial to the District's water supply reliability.

Some parties interested in Bay-Delta issues are advocating reducing the reliance on water that originates in the Bay-Delta watersheds. The potential for reducing water demands from the Bay-Delta watershed is currently being discussed as part of the Alternatives Development Phase of the CALFED Bay-Delta Program.

Implementation Uncertainties

Implementation uncertainty refers to the risk of being unable to achieve full implementation of planned projects or programs. Only those planned projects with high probability of implementation and well understood impacts were included in the baseline projection.

There is a risk that water savings from the District's conservation programs will not meet program goals. The success of the conservation program depends on participation of residents and businesses in the County, which is not under District control. However, the District can influence participation by increasing incentives or District outreach if necessary to meet program goals.

Water recycling projects are being developed by the wastewater treatment plants in the County, not the District directly. Only currently operational recycled water projects or planned projects with high levels of implementation certainty were included in the baseline projection. Actual future recycled water supplies may be greater than considered in the baseline due to additional recycled water projects being implemented.

Technical Assumption Uncertainties

In analyzing projected water supplies and demand, a number of assumptions are required. These technical assumptions include the demographic projections and future water use patterns that underlie the water demand projections, and estimates of the groundwater storage capacities and natural groundwater yields that help characterize the groundwater resource.

Making technical assumptions is a necessary risk. As an example, the technical assumptions in the demand projection anticipate adherence to the County and City General Plans and stability of the economy. General plans are volatile documents that change often and the economic and business climate is subject to national and international influences that are difficult to anticipate. Given the large uncertainty in water demand forecasting, a demand range was adopted. The likelihood that the actual future water use will lie outside the planning range is believed to be very small. As for other technical assumptions, the best information and technology available has been used. As additional information becomes available, assumptions may be modified.

Operational Risks

There are some risks that District system operations may change in the future, due to changes in District priorities or modifications to the system that alter the capacity of the system to convey, treat, or deliver water. For example, water supply and flood control objectives conflict when it comes to reservoir operations. The District's local reservoirs were built as water supply facilities and are operated to maximize the beneficial yield for water supply. Only the Anderson/Coyote system is operated for both water supply and flood control objectives. If the District were to reoperate local reservoirs to keep storage levels down so that flood control storage space was provided, the beneficial yields of the reservoirs would decrease.

System Vulnerability

The District operates a system of reservoirs that store local runoff and imported water, groundwater recharge facilities that subsequently percolate these waters, conveyance pipelines, and water for potable use. The components of the District's water supply system are vulnerable in varying degrees to natural or man-made disasters, such as earthquakes, flooding, or contamination.

As an example, the upflow clarifiers at the District's Rinconada WTP were extensively damaged during the Loma Prieta earthquake. Fortunately, one of the units was out of service for maintenance at the time, and escaped damage. The plant was running at reduced capacity within 24 hours. If all the units had been damaged, the time before the plant could be restored to service could have been at least 6 months.

The probability that such a disaster will occur over the next 30 years is significant, with the potential for significant impacts to the District's ability to meet the needs of the County.

Infrastructure Risks

Infrastructure risks are similar to system vulnerability risks, but have permanent consequences. Land subsidence, salt water intrusion, or major groundwater contamination all could potentially permanently impact the County. For example, the District currently is studying the nitrate problem in the South County groundwater basin. If the District program is unsuccessful in addressing this water quality concern, or some other water quality contamination is identified that makes the groundwater basin unusable as a source of supply, the District could lose 100,000 af of usable groundwater storage, 45,000 af of natural groundwater recharge, and more than 20,000 af of surface water yield. Since the groundwater basin is currently the only supply in South County, such a loss would be devastating.

Financial Risks

Financial risks refer to the possibility that major capital investments in facilities may turn out to be unnecessary. For example, if a major facility were to be constructed to meet demand projections that exceed actual future water use, an unnecessary expenditure will have taken place.

Chapter 6
SUPPLY OPTIONS

This chapter explores new supply options that were considered for meeting the critical dry period water supply shortage of the County. These include non-potable and indirect potable water recycling, desalination, capturing additional local streamflows, additional local groundwater storage, additional surface storage, water banking programs, the State Drought Water Bank, long-term and short-term water transfers, and changes to the District's water system operations. The chapter describes the District's current understanding of each of these sources (including cost estimates where available), and highlights those components that may require additional analysis.

Recycled Water

The District and several local agencies in the County are investigating two types of recycling and reuse projects that can supplement water supplies: non-potable water recycling, and the surface storage and subsequent groundwater recharge and treatment of recycled water for a potable supply. These two types of projects have very different implementation issues, schedules for implementation, and project costs. Exporting non-potable recycled water from the San Francisco Bay Area to the Central Valley for agricultural use in exchange for other raw water supplies is also being investigated.

Recycled water has been recognized as a valuable source of water in the County. As a supplemental supply, recycled water is drought-proof and independent of future decisions regarding the Delta water rights reallocation.

Non-Potable Water Recycling

A 1987 survey found that 300,000 af/year of recycled water was used in California. Of this quantity, approximately 70 percent was used for irrigating landscape plants and agricultural crops. About 2,000 af/year of recycled water is currently being used for landscape irrigation in the County.

In July 1993, the Board adopted a non-potable recycling policy which provides for the District's financial participation to encourage the development of non-potable recycling projects in the County. The District will provide financial assistance equivalent to the avoided cost of new water supplies for non-potable recycled water produced. Such water must, however, supplement the County's water supply and replace firm water demands that are presently met or would be met in the future by supplies from the District.

Several non-potable water recycling projects are currently under development by local agencies and/or the District. The estimated yield from these projects is summarized in Table 6-1. The District will continue to look into opportunities for cooperative programs with local wastewater agencies to promote the use of more non-potable recycled water in the County.

San Jose/Santa Clara Recycling Project (South Bay Water Recycling Program)

The San Jose/Santa Clara (SJ/SC) WPCP is a jointly-owned regional wastewater treatment plant with a design flow capacity of 167 mgd. The plant effluent is tertiary treated to high-quality standards, and may be reused for industrial process and agricultural and landscape irrigation.

In November 1990, the Board approved a cost-sharing agreement with the City of San Jose for investigating the potential reuse of treated effluent from the SJ/SC WPCP in the Golden Triangle. Three project alternatives were developed, and the project, which had the potential to extend beyond the Golden Triangle, was selected and approved by the San Jose City Council, contingent upon environmental review and the acceptance of the South Bay Action Plan.

In December 1996, the RWQCB directed the SJ/SC WPCP to prepare an alternative solution to the previously adopted South Bay Action Plan. The RWQCB ordered the cities to return within 6 months with a plan to reduce flows to the Bay. This decision was precipitated by average dry weather flows during the summer of 1996 which exceeded the 120 mgd limit set by the RWQCB.

In June 1994, the program completed a study for the expanded area and reassessed the market for non-potable recycled water. The study showed that approximately 9,000 af/year, or 16 mgd, of recycled water could be delivered to the Golden Triangle beginning in 1997. Additional demands of 28,000 af/year or 50 mgd in the Greater San Jose area have been identified and could be delivered in the future. Most of this water would displace District supplies.

In October 1994, the program assembled a blue ribbon committee to reassess the yield of recycled water of Phase I (the Golden Triangle portion) of the project. To assure the project delivers 21 mgd average dry weather flow, the committee recommended expansion of the pool of potential users in Phase I, and reconfiguration and extension of the proposed Phase I pipelines southerly and easterly to the Villages in South San Jose.

The pipeline design for Phase I is currently underway and construction is expected to be completed in 1997. The estimated capital cost for this phase is $130 million. To develop Phase II of the project, approximately $282 million in additional capital is required. The average unit cost of recycled water for Phases I and II is estimated at $1,300/af.

Sunnyvale Recycling Project

The Sunnyvale WPCP has a design flow capacity of 29 mgd for the treatment of wastewater from the City of Sunnyvale, with predrought inflows of 17 mgd. The current discharge flow from the plant is approximately 14 mgd due to drought-related water conservation measures. A wastewater recycling program developed in 1991 identified a short-term goal of recycling 20 to 30 percent of the high-quality tertiary effluent. A long-term goal of this program is to reuse 100 percent of the effluent generated from the plant.

The City of Sunnyvale has started a major capital improvement program to implement the short-term goal of this program. Based on the current schedule, approximately 1 mgd of recycled water will be delivered to the Bayland Park, the City Municipal Golf Course, and nearby sites in 1996. Additional pipelines and pump stations are scheduled to be constructed in 1996 to deliver approximate 1.2 mgd of recycled water to serve the demands north of Highway 237 in 1998. This recycled water could displace either Hetch-Hetchy supplies or District supplies. The unit cost of recycled water produced from the Sunnyvale WPCP for these projects is estimated at $900 per af.

Gilroy Recycling Project

The existing South County Regional Wastewater Authority (SCRWA) provides wastewater treatment for the cities of Gilroy and Morgan Hill. A long-term plan was developed in June 1991 that outlined the phased implementation of new wastewater and disposal facilities for the next 20 years. This plan proposed a new 7.5 mgd secondary wastewater treatment facility; about 3 mgd of the secondary effluent will undergo tertiary treatment to meet the higher standards for reuse required for landscape and agricultural crop irrigation and some industrial processes. Construction of these facilities was completed in 1994. The SCRWA wastewater treatment facility currently treats 6.1 mgd. A proposed expansion would achieve 15 mgd capacity by the year 2018.

Approximately 51,000 af/year of non-potable recycled water could be developed throughout the County. Of this quantity, 14,400 af/year of recycled water is used as the baseline yield in this study. The average cost of non-potable recycled water is estimated at $1,310 per af including O&M costs.

In 1995, the SCRWA completed a water recycling planning study, including a long-range regional plan to facilitate the use of recycled water in South County. The best apparent alternative identified in the report could potentially deliver 6,900 af/year of recycled water to municipal/industrial and agricultural users. The report also recommended five major building blocks which are capable of serving recycled water demands with the ultimate recycling facility flow of 15 mgd.

The estimated cost of delivering recycled water for each building block ranges from $680/af to $1,970/af. The estimated average unit cost of recycled water developed by SCRWA is $1,780/af. Due to the high cost of delivering recycled water to Morgan Hill, the potential users in Morgan Hill were not considered in the alternative development process of the report.

In 1996, the District constructed a portion of irrigation pipelines for a flood control mitigation project at Llagas Creek between Highway 152 and Leavesley Road in Gilroy. The project is scheduled to be expanded to Morgan Hill in the near future, and recycled water will be used for irrigation wherever possible. The District has explored with the SCRWA the possible use of these project irrigation pipelines to deliver recycled water to Morgan Hill and Gilroy. The SCRWA will evaluate the feasibility of incorporating this opportunity into the South County long-range water recycling plan.

Palo Alto Recycling Project

The Palo Alto Regional Water Quality Control Plant (PARWQCP) provides wastewater treatment and disposal capacity of 38 mgd for the cities of Palo Alto, Mountain View, Los Altos, and Los Altos Hills. In April 1992, the PARWQCP completed a water recycling master plan which identified two purposes for pursuing a recycling project: to provide additional water supply to the water utilities in the study area and to reduce the wastewater constituent mass metal loadings discharged to the South Bay from the plant.

Currently, the PARWQCP delivers 400 af/year of recycled water to the cities of Palo Alto and Mountain View. Based on the project alternatives recommended in the master plan, a total of 4,700 af/year of recycled water could be developed within the plant's service area. The estimated unit cost of recycled water developed by Palo Alto Regional Plant is $860/af. This recycled water is not expected to displace District supplies but would displace water from the Hetch-Hetchy system.

The estimated baseline and potential yield, and capital and unit costs for the four recycling projects described above are summarized in Table 6-1.

TABLE 6-1
Countywide Non-Potable Water Recycling Projects
Baseline and Potential Yield

Non-Potable Water Recycling Projects	Year 2020 Estimated Baseline Yield (af/yr)	Estimated Potential Yield (af/yr)	Estimated Capital Cost ($1,000s)	Estimated Recycled Water Unit Cost ($/af)
San Jose/Santa Clara Recycling Project	9,000	37,000	411,175	1,300
Sunnyvale Recycling Project	2,400	2,400	18,525	900
Gilroy/Morgan Hill Recycling Project	2,600	6,900	104,861	1,780
Palo Alto Recycling Project	400	4,700	34,565	860
Total	**14,400**	**51,000**	**569,126**	**Avge. 1,310[1]**

[1] Weighted average.

Indirect Potable Water Recycling

Recharging the underlying groundwater aquifers with treated recycled water is a potential source of supply for the County. In a joint study with the City of San Jose the District has determined that up to 25,000 af/year of indirect potable recycled water could be developed for groundwater recharge under criteria proposed by the State Department of Health Services (DHS).

At the present time, DHS allows only indirect reuse (i.e., groundwater recharge) of recycled water for potable drinking water supplies. Currently, the California Office of Drinking Water is developing guidelines for planned projects to recharge recycled water into groundwater basins. The guidelines would allow two principal methods for groundwater recharge: surface recharge through percolation, and direct injection.

WateReuse (the California Association of Water Recyclers), through its Potable Reuse Regulatory Subcommittee, has drafted and submitted to state agencies a proposal for using surface reservoirs as blending facilities for indirect potable recycled water. The recycled water would have to meet the same or more stringent water quality requirements as for groundwater recharge. It would need to be treated with reverse osmosis (RO) or equivalent technology before it is released to a reservoir, and it would also have to reduce any nutrients in the water that could cause algal growth within a reservoir. This water could be withdrawn and recharged or transferred through pipelines and used at a conventional water treatment plant. This new mode of operation better complements the District's system, would not compete with limited recharge facilities, and would allow 60,000 af/year of indirect potable recycled water to be integrated into the current system. State DHS will still need to approve of the concept of using a surface reservoir for blending indirect potable recycled water before any future project could be undertaken. The estimated unit cost of indirect potable recycled water developed for groundwater recharge and for using Anderson reservoir for blending ranges from $1,900/af to $2,200/af.

The State Department of Health Services recently approved the concept of using a surface reservoir for blending indirect potable recycled water. Technological advances may bring costs down. However, concerns remain about public acceptance and disposal of brine resulting from reverse osmosis treatment.

The major concerns regarding the application of indirect potable recycled water for groundwater recharge or using a surface reservoir for blending are: (1) health effects considerations and the possibility of degrading the groundwater basins, (2) public acceptance, (3) existing system limitations to recharge an additional source of water, (4) future water quality standards that could be more restrictive, and (5) high project costs.

Bay Area Regional Recycled Water Export Project

The Central California Regional Water Recycling Project (CCRWRP) study, financed by a joint powers agreement consisting of 15 local water and wastewater agencies and USBR, was completed in March 1996. The purpose of this study is to determine the feasibility of exporting recycled water for other uses outside the San Francisco Bay Area. Approximately 658,400 af/year of recycled water could be developed from Bay Area wastewater treatment plants in year 2020. Of this quantity, 205,000 af/year is estimated to be reused in local recycling projects and 453,400 af/year is available for export.

The study identified six alternatives: (1) export to the Delta Mendota Canal; (2) export to the Bay-Delta Area; (3) export to Monterey Area; (4) export to the Southern San Joaquin Valley; (5) indirect potable reuse; and (6) no project. Each of the six alternatives was evaluated based on the criteria established by the participating agencies for technical, economic, environmental, public acceptance and political/institutional feasibility. The study identified alternatives 1, 2, 3, and 3a (a combination of 2 and 3) as potentially feasible and recommended these alternatives be further investigated in the next phase. The estimated unit cost of recycled water developed from these alternatives ranges from $1,000/af to $1,200/af.

Desalination

Improving technology may make seawater desalination viable in the future.

Seawater from the Pacific Ocean off the California coast has a total dissolved solids (TDS) of 34,000 mg/l. To desalinate this water to an acceptable level for drinking water, the TDS must be lowered to 500 mg/l or less. Because of the tremendous amount of thermal and electrical energy required for the process, desalination for municipal drinking water supply has not been used in California until recently. During the recent drought, a number of California water agencies began exploring desalination to meet their potable water demands. A desalination plant produces 40 percent of the City of Morro Bay's drinking water, and the United States' largest RO seawater desalination plant in Santa Barbara can produce one-third (7,500 af/year) of the city's water needs. Metropolitan Water District recently participated in a $600,000 pilot plant study to evaluate the feasibility of a seawater desalination facility capable of producing 100 mgd of potable water and generating 500 megawatts of power along the Pacific Coast near Tijuana, Mexico.

Distillation, membrane processes, and ion exchange are the three major processes for turning seawater into potable water. Due to the high cost (above $4,000 per af) of an ion exchange process for desalting source water with TDS higher than 1,000 mg/l, feasible options include only distillation and membrane processes. Distillation processes cost approximately $3,000 per af. The cost of RO, which is the most common membrane process, ranges from $1,800 to $2,700 per af.

The majority of the annual costs for desalination goes to energy requirements. This has been the greatest impediment to developing a practical technology to desalinate seawater. Other major issues for the development of a desalination plant are: (1) site selection; (2) concentrate discharge; (3) project and operation and maintenance costs; and (4) water quality.

Capturing Additional Local Streamflows

About 49 percent of the County's regulated streamflow has been developed into local water supply. Existing local supplies can be limited due to either existing reservoir capacity or downstream recharge capacity. A reservoir may be too small to capture all of the reservoir inflows that could be developed into a beneficial yield. If a reservoir spills frequently, much of the flow that could have been developed will instead flow to the Bay. On the other hand, the yield of a stream system could be limited due to the downstream recharge capacity. If the streamflows are much higher than the recharge capacity, the total flow will not be fully developed. If more recharge capacity were developed on these streams, the local streamflow could be recharged to the groundwater basin, to be available later as water supply.

Storage capacity refers to the quantity of water that can be stored in a facility, such as a reservoir, groundwater basin, or water bank. Yield is the amount of water that can be supplied from a facility in a specific time interval (usually 1 year). In the case of multiple-year drought events like the CDP, the annual yield can be significantly smaller than the storage capacity since the storage is depleted over several years.

The District will study the potential effect of increased reservoir capacity and/or recharge capacity on local water supply. The District has identified three reservoir and stream systems, described below, in which increased reservoir and/or recharge capacity would increase the District's ability to use or store water. However, during a CDP, very little additional local yield is available from these streams.

Stevens Creek

In Stevens Creek, all of the streamflow is derived from reservoir inflow. Therefore, all of the flow, which averages about 10,400 af/year, is regulated by the dam and reservoir. This flow has the potential to be captured and put to use as water supply yield, either when demands require it or when downstream recharge capacity is available. During a CDP, an average of 2,100 af flows into Stevens Creek Reservoir and is put to beneficial use.

During a CDP, all of the County's local streamflows are already developed into local yield. Thus, new facilities and/or expanded existing facilities will not provide additional local supplies during a future drought. However, they could augment the District's supplies during average years.

With the existing reservoir size, which has a storage capacity of 3,465 af, and the downstream recharge system, only 32 percent of Stevens Creek Reservoir inflow is developed into local yield. More local yield could be developed by increasing recharge capacity downstream of the reservoir. Land values in the Stevens Creek area are high, and there are few areas that are currently undeveloped and suitable for percolation ponds. In this case, groundwater injection wells may be a possibility for increasing the amount that can be recharged into the groundwater basin; however, this option may require treatment facilities. Another alternative may be to divert the streamflow to another watershed for recharge into the groundwater basin. In any of these cases, an analysis of the groundwater basin is needed in order to determine the areas where groundwater recharge will benefit the basin. The IWRP process will determine whether further investigation is needed regarding the alternatives for increasing local yield from the Stevens Creek Reservoir system.

Alamitos Creek

Because of its location, Calero Reservoir can store local water as well as temporarily store imported water from the San Felipe Project and the SWP. The local water can either be the inflow that directly enters Calero Reservoir, or Almaden

Reservoir inflow that has been diverted through the Almaden-Calero Canal rather than flowing into Alamitos Creek. Though the yield from Calero Creek is only about 54 percent of the streamflow, a large percentage of the streamflow is downstream accretion, which is unregulated by the upstream dam and reservoir. Therefore, as a percentage of the reservoir inflow, the yield developed on Calero Creek is actually quite high. However, as shown in Table 5-3, the yield from Alamitos Creek is only about 38 percent of the streamflow, of which Almaden Reservoir inflow makes up about 93 percent. Therefore, there is potentially more local yield that could be developed from Alamitos Creek through an enlargement of Calero Reservoir and the expansion of the downstream recharge system or adding pumping capacity to bring more flow into the Almaden pipeline. However, during a CDP Alamitos Creek averages only 2,500 af, all of which is completely utilized.

In addition, Calero Reservoir can provide storage capacity for San Felipe water brought through the Cross Valley Pipeline and for SBA water brought through the Almaden Valley Pipeline. The water stored in the reservoir can then be released back into the District's Almaden Valley Pipeline during peak demand periods. Therefore, increasing the storage capacity in Calero Reservoir has the added benefit of increasing the operational flexibility of the District's raw water system, as well as developing additional local yield.

Uvas Creek

On occasion, the Uvas Reservoir system has very high reservoir inflows and downstream accretion streamflows in relation to the reservoir's size and existing downstream recharge capacity. Uvas Reservoir spills quite frequently because the average reservoir inflow of more than 27,000 af/year is much larger than the reservoir capacity of 9,950 af. Due to the limited size of the reservoir, the present yield from Uvas Creek is about 8,000 af/year, which is only about 16 percent of the total streamflow and 30 percent of the reservoir inflow. Therefore, more local yield could be developed from the Uvas system with increases in reservoir and/or recharge capacity. Because the areas around Uvas Creek are less developed and urbanized, there may still be suitable undeveloped areas for recharge ponds. The viability and cost of raising Uvas Dam, increasing recharge capacity along Uvas Creek, and diverting the water into another watershed for recharge will also be investigated. During a CDP, the inflow into Uvas reservoir averages only 5,400 af, all of which can be put to beneficial use within the existing system.

Inflatable Dams

The District has used operational modeling to evaluate two inflatable dams for year-round recharge in Guadalupe River. The dams were deflated if the flow exceeded 100 cfs and if water was available to allow 5 cfs to pass downstream. During the wet period of 1982 to 1983, very little benefit would have been realized, since the 100 cfs maximum flow was exceeded frequently and the dams were not allowed to operate. But during a dry period, such as 1988 to 1989, the dams would have allowed recharge of an additional 1,200 af of water from October through April.

Additional Local Groundwater Storage

Ground subsidence due to groundwater basin overdrafting has occurred in Santa Clara County in the past. Most recently, between 1960 and 1965, the ground subsided 2 feet in some areas of the County. Subsidence can cause damage to existing buildings and infrastructure, resulting in costly impacts to the community.

Groundwater storage allows water to be carried over to a hydrologically dry period when the supply is needed. Currently, the District manages the County's groundwater subbasins to prevent land surface subsidence from occurring. Groundwater levels, recharge, and pumping are all monitored so that groundwater levels are kept above the threshold where subsidence is expected to occur. The operational storage capacity of the groundwater basin is the storage available above this subsidence threshold.

Additional groundwater storage is available below the subsidence threshold. This may be an option for helping to meet the CDP water supply shortage; however, overdrafting the basin once the subsidence threshold has been reached is expected to cause subsidence to resume. The amount and location of groundwater pumping, and the length of time that the basin is below the subsidence threshold, all influence whether and at what rate subsidence will occur.

Additional Surface Storage

Additional surface storage could be used to capture more local flows, provide more storage capacity for existing contracted imported sources, or store future water transfers or recycled water. If located near the SBA or the San Felipe Project, additional surface storage could also increase the District's ability to more efficiently utilize existing contract amounts of imported water. This water could be stored for use during later times of need or when system capacity is available.

In very wet years when there is an abundance of local water, imported water that cannot be utilized at the treatment plants or recharged into the groundwater basins could be stored for future use. Additional surface storage would also give the District the ability to take water transfers during wet years when more water of potentially higher quality may be available, and store it for later use. This would increase water supply reliability during times of low local and imported water supplies and could improve water quality.

Even though a new reservoir may be viable from the perspective of water supply benefits and site availability and suitability, it may not be as viable as other components in terms of regulatory approvals. It is becoming increasingly difficult to get project approval for a new reservoir in the current regulatory environment. Very often, the construction of a dam will have significant environmental impacts on wetlands and species under the protection of federal or state regulations. Impacts on wetlands are regulated through the Section 404 permit process of the Clean Water Act (CWA). Species may be protected through the 1973 federal ESA or the 1984 California ESA. In addition, a proposed activity such as the construction of a dam would be subject to the environmental requirements of the CEQA and the National Environmental Protection Act (NEPA).

As with many of the other components, the District has begun to investigate several options for increasing surface storage; these are described below. All of these will require further study in order to determine project feasibility and to evaluate the associated impacts and benefits.

Surface storage can provide more storage capacity for existing contracted imported sources, or store future water transfers or recycled water. It is becoming increasingly difficult to get project approval for a new reservoir due to potential adverse impacts on wetlands and endangered species.

Anderson Reservoir Expansion

The location of Coyote and Anderson reservoirs makes additional storage in these facilities a potential alternative. However, the expansion of Coyote Dam is not feasible because of geologic and seismic concerns at the existing abutment. Additional reservoir storage in Anderson could provide long-term carryover storage for water imported from the San Felipe Project or for water transfers brought through the San Felipe system. A preliminary investigation indicates an estimated CDP yield of 25,000 af/yr could be developed by increasing the reservoir storage to 200,000 af. The estimated construction cost for enlarging Anderson reservoir is $280 million excluding land acquisition, environmental studies and mitigation.

Raising the existing dam at Anderson may be less costly and have fewer environmental impacts than the construction of a new reservoir. However, there are several possible constraints to the expansion of Anderson Reservoir. Some environmental issues include the known presence in the Anderson watershed of several species of concern which may be listed as endangered in the future. Land use issues are also a constraint because some of the area around the reservoir has been developed, and a number of homes and property owners would be impacted. Access and road relocations would also be an issue. In addition, there are potential constraints on reservoir expansion due to possible soil and groundwater contamination at the northern end of the reservoir. Issues about District liability for water stored in a different watershed would also have to be investigated.

New In-County Reservoir

By capturing local runoff, a new in-County reservoir could develop a small amount of additional local yield. However, the main purpose and value of a new reservoir would be its ability to store imported water, either existing entitlements or water transfers. Currently, during locally wet years, the District cannot import and utilize all of its imported entitlements. A new reservoir would increase the District's ability to maximize its existing entitlements by providing the storage for unused entitlements, thereby increasing system reliability. In addition, water transfers available in wet years could be stored for use during a time of low local and imported supplies.

The District's water supplies and facilities are vulnerable to distribution outages from earthquakes, hazardous chemical spills and other supply disruptions. In recent years, there has been increasing seismic activity in areas surrounding the District's water supply sources. Hazardous chemical spills continue to be a threat to local groundwater supplies and water that is transported through the Delta. Though disaster preparedness plans are certainly useful, construction of facilities to provide system redundancy and emergency water supplies may also be required. A new in-County storage reservoir could provide greater system reliability for these emergencies.

In August 1991, the District completed a preliminary evaluation of alternative dam and reservoir sites. This was a feasibility investigation of 13 possible reservoir sites, in largely undeveloped areas, that could be integrated into the District's facilities because of their proximity to the conveyance system of the San Felipe Project. A reconnaissance-level evaluation of alternative dam and reservoir sites was completed in February 1993. The purpose of this study was to identify potential constraints on the development of dams and reservoirs, characterize the nature and the significance of the constraints, and identify those areas for which more detailed studies would be required. From this study, reconnaissance-level cost estimates were developed. Reservoir construction costs vary greatly depending upon reservoir location and final design, with smaller reservoirs at some sites costing much more than larger reservoirs at other sites. Cost estimates for reservoirs at six alternative sites with the greatest storage capacities (150,000 to 350,000 af) ranged from $190 to $616 million. These estimates did not include land acquisition, environmental studies and mitigation.

Los Banos Grandes Reservoir

The Los Banos Grandes (LBG) Reservoir is a potential off-stream storage facility located south of the Delta in western Merced County just south of San Luis Reservoir. It was specifically authorized by the Legislature in 1984 and is part of the DWR's effort to provide the operational flexibility needed to meet the "water storage" concept encouraged by the Legislature in 1984. This concept involves the storage of water in facilities south of the Delta during periods of high winter flow for later release to meet needs during drier periods, thereby reducing summer demands for Delta exports. By reducing exports during late spring and summer, more water remains in the Delta system to maintain water quality standards and reduce the impacts to the Bay-Delta fishery.

DWR completed studies on the feasibility of a proposed LBG project, and prepared a Draft EIR for the project, dated December 1990. The LBG facilities considered in the studies consisted of a 1.73 million af off-stream storage reservoir with associated pumping-generating plants and conveyance channels. The project would store intermittent high flows conveyed through the California Aqueduct from the Delta, and also generate power by releasing water to the existing Los Banos Reservoir, which would function as a forebay. LBG would retain about one-half to two-thirds of its volume each year to reduce shortages during below-normal, dry or critically dry years.

While the District expressed interest in becoming a participant in LBG as a State contractor, it also expressed interest in participating in LBG as an independent agency in May 1992. At that time, DWR planned to only allocate the project yield to all participating SWP contractors, probably on the basis of their maximum annual SWP entitlements. Because the cost of the LBG project made it infeasible for some SWP agricultural contractors to participate, DWR then considered the allocation of the project yield only to participating contractors.

The District, however, will continue to evaluate the possibility of buying a portion of any proposed LBG storage capacity and operating it independently of the SWP. There could be a number of advantages to this reservoir storage alternative as compared to the construction of a new in-County reservoir: fewer environmental impacts, less cost, and less time to implementation. The estimated construction cost for the reservoir is $891 million excluding land acquisition, environmental studies and mitigation.

Upper Del Valle Reservoir

The District has participated with the other SBA contractors (Alameda County Water District and Zone 7-Alameda County Flood Control and Water Conservation District) to identify and evaluate alternative projects for new off-stream storage reservoirs that would provide additional water and emergency supplies, and improve the capability and water quality of the SBA system.

The first phase of this investigation was a reconnaissance-level screening of alternative storage and conveyance projects along the SBA. In a report dated February 1990, a new 28,000 af reservoir (Upper Del Valle Dam and Reservoir)—which could be constructed at the upper end of the existing Lake Del Valle, a feature of the SWP in southeastern Alameda County —offered the best opportunity for the SBA contractors to improve their water supplies. The estimated construction cost for the reservoir is $40 million excluding land acquisition, environmental studies and mitigation.

Three alternative water supply sources were evaluated for the reservoir project. The three sources include unscheduled or surplus water in the Delta, water purchased in the Central Valley area and advance deliveries of SWP entitlements.

A thorough analysis was made of each alternative, and it became evident that it was not possible at that time to realistically quantify the amount of water supplies that would be available for export from the Delta for the project. The District and other SBA contractors decided in April 1993 to postpone completion of the studies until meaningful information could be obtained regarding potential water supplies for the project.

Water Banking Programs

The basic concept of a water banking program is that one party transfers water to another during normal and wet years, and the water (or a portion of it) is transferred back again during dry years. Banking programs commonly involve either actual groundwater recharge of the banked water, or "in lieu" recharge through direct use of the surface water in place of groundwater pumping. During return years, groundwater or other supplies are used in place of surface water that is transferred back to the banking entity, and/or a certain amount of crop conversion or fallowing may occur. Other types of banking can be based on shared use of surface storage facilities, or simply guarantees of return from future water year allocations or supplies.

Finding a banking partner that is willing and able to take the District's unused CVP, SWP, or transfer water in normal and wet years, and return water in dry years, has proved to be a challenging task. In recent years, new regulatory restrictions have severely impacted the reliability of water supplies in the Delta export area, particularly those of CVP and SWP irrigation contractors. There are fewer water districts willing to disrupt the farming operations of their water users to accommodate a banking program. The benefits to the banking partner are not always readily apparent or quantifiable: improved dependability of "average" water supplies (offset by greater shortages, possibly, in dry years); substitution of surface supplies in lieu of higher-cost groundwater pumping; and reduction in groundwater pumping costs due to raising the water table.

Provisions of a banking agreement generally include the sources and quantities of water to be banked; the period of time in which banking and withdrawals can occur; provisions for conveyance and evaporation losses, and aquifer losses if water is stored in a groundwater basin; economic benefits and costs; and criteria regarding annual operation of the program. A key feature of a banking agreement is the exchange ratio, or the water kept by the banking agent. Exchange ratios may be as little as 10 percent to cover actual seepage and evaporation losses, in which case they are most likely accompanied by a significant monetary fee ($150 to $200 per af). Exchange ratios vary depending upon the hydrologic year, averaging 2 to 1 or higher in agreements where the receiving party pays for water received (e.g. 2 af or higher of wet-year water into the bank equal to 1 af of dry-year water out of the bank).

One program that appears to be immediately viable for the District has been developed by a SWP contractor. After developing the program for approximately 10 years, the Semitropic Water Storage District (Semitropic) has completed a long-term agreement with Metropolitan Water District of Southern California for 35 percent of the program. The

The District is currently involved in two water banking agreements:

- *In 1993, the District reached an agreement with San Benito County Water District (SBCWD) for banking 5,650 af of the District's CVP entitlement water in San Justo Reservoir. SBCWD keeps 10 percent of the total quantity transferred for its own use. To account for seepage and evaporation losses, the water returned to the District each year will be reduced by an additional 10 percent.*

- *In 1996, the District reached an agreement with Semitropic Water Storage District (Semitropic) for a one-time banking agreement of 45,000 af in the Semitropic groundwater basin. The agreement provided for Semitropic to keep 10 percent of the total quantity, and allowed the District to take the other 90 percent in future years.*

Semitropic program would involve a relatively small exchange ratio (about 10 percent), but a significant storage fee. The underlying purpose of the program is to provide the financing necessary to improve Semitropic's conveyance, pumping, and groundwater recharge/extraction facilities, and to reduce the cost of water to their irrigators. The District's ability to store and extract water from Semitropic would be limited to a pro rata share of total storage and extraction capabilities. For example, if the District established rights to 300,000 af of the bank's total storage of 1,000,000 af, the District's access to storage and extraction capacities would be limited to 30 percent of total storage and extraction capacities. These kinds of limitations would affect the optimum level of District participation in the program.

The District has also discussed the possibility of storing water with other entities in the San Joaquin Valley. For example, the San Joaquin River Exchange Contractors Water Authority has one of the most reliable water supplies in the Delta export area, and could return water from a bank in dry years. However, the exchange contractors are limited in their ability to store water because any water conveyed to them in federal facilities (e.g., the Delta-Mendota Canal) would have to be used on lands which meet the acreage limitation requirements of the Reclamation Reform Act (RRA). Since the exchange contractors have not been required historically, under their own CVP contract, to comply with the RRA, much of their demand for water is on excess or ineligible lands. In order for a storage program to work with the exchange contractors, the District would have to find a way to deliver water to them through nonfederal facilities and/or build groundwater recharge and extraction facilities so that the program could be based on physical recharge instead of "in lieu" recharge.

One or more water storage programs could provide significant dry-year supplies through banking of existing CVP and SWP supplies in normal and wet years. The District could also use storage programs to store transfer water that could not be used in the County in a given year. One potential risk is that if the basin in which the storage is occurring is being overdrafted then the basin could be adjudicated and the District could lose this storage option. Water already in the groundwater basin would be protected under State law and available for eventual return to the County, but the basin itself as an ongoing storage option could be terminated. Another risk is that the party operating the basin finds itself financially unable to continue operating for some reason; however, this risk can be minimized using the legal concept of a trust. The total unit cost of water banking is estimated to be approximately $322 per af.

Long-Term Water Transfers

In evaluating water transfer proposals, costs, risks, reliabilities, environmental constraints, protection of groundwater aquifers, third-party impacts, water rights, and water conveyance abilities should all be considered.

The recent prolonged drought in California has prompted renewed interest in the concept of water marketing, which can be defined as the voluntary transfer, lease or sale of water or water rights. Water marketing was endorsed in 1992 by Governor Wilson in his State Water Policy as a necessary means of stretching California's supply of developed water to meet future water needs. Yet, despite general consensus that some form of water marketing must be facilitated, there is considerable debate about how this activity should be carried out.

The major unresolved issues surrounding water marketing involve the lack of a set policy or legal precedent for water transfers. Other issues include environmental and third-party impacts, protection of water rights, the role of state government, the role of water districts, and the need for additional water storage and conveyance facilities. Rules for water transfers are contained in proposed state and federal legislation, and in the interim policies of the USBR and other government agencies. The ultimate form of these legislative and administrative rules governing water transfers will significantly affect the extent to which this alternative becomes a part of the District's imported water supplies.

Two primary types of long-term water transfers are: (1) water rights or entitlement transfers; and (2) dry-year option transfers. Water rights or entitlement transfers involve purchasing an appropriative water right or contract entitlement from another SWP or CVP contractor. Some amount of imported supply would be available from the water right or entitlement every year, usually more in wet years and less in dry years. The District would have to take these potential shortages into account in determining the amount to purchase, or provide storage to make sure adequate supplies are available in dry years. Such water right or entitlement transfers can be permanent assignments, or can be for a defined period of time with options to renew. Obviously, a permanent assignment of a water right or contract entitlement has the least risk of non-renewal. Purchase terms usually include payment for the water right or entitlement at the start, with ongoing payments to the federal or state government for operations and maintenance.

Dry-year option transfers include entering into a contract with another party or parties to purchase additional imported water during dry periods. The District would pay for the option to buy the water every year, and would pay an additional amount when the water was actually delivered. Such dry year option agreements are typically for a defined period of time with options to renew. Based on long-term water transfer proposals that have been analyzed by the District, the total unit cost of long-term transfers from various sources is estimated to be approximately $270 per af. Sources of transfer water are the water contractors of the CVP and the SWP, and independent water right holders.

Central Valley Project Transfers

In October 1992, federal legislation (Title 34, P.L. 102-575) was enacted which increased the ability of CVP contractors to transfer their allocations of CVP water. This legislation, CVPIA, authorizes water transfers from "all individuals or districts" receiving CVP water "to any other California water use or agency . . . for project purposes or any purpose recognized as beneficial under applicable State law." The CVPIA thus expanded authorization of CVP water transfers in four ways: (1) water may be transferred from one project purpose to another (e.g., from irrigation to M&I); (2) individual water users may now transfer water; (3) the San Joaquin River Water Rights Exchange Contractors may transfer water; and (4) water may be transferred to individuals or districts outside the CVP service area.

In March 1993, the USBR completed interim guidelines for water transfers. Under these guidelines, all transfers require review and approval by the contracting officer. All long-term transfers are subject to continuing annual review and may be "conditioned, temporarily suspended, or terminated" if the contracting officer determines that there are any adverse impacts to CVP operations or the environment.

Among CVP contractors, those with the most reliable source of transfer water are the San Joaquin River Water Rights Exchange Contractors (Exchange), which include the San Luis Canal Company, the Columbia Canal Company, the Firebaugh Canal Water District, and the Central California Irrigation District. The Exchange contractors have a unique and perpetual contract with the USBR for the delivery of 840,000 af/year of CVP water from the Delta-Mendota Canal in place of water that would have otherwise been taken by the Exchange contractors from the San Joaquin River under riparian and pre-1914 appropriative water rights. The contract provides that, based only on the total annual inflow to Shasta Reservoir, this CVP supply may be reduced by no more than 25 percent. Such shortages have occurred only three times within the last 42 years. Prior to enactment of the CVPIA, districts or individuals receiving CVP water under the Exchange contract could not transfer this water.

Another reliable source of transfer water within the CVP is the Sacramento River Water Rights Contractors. These contractors have settled with the federal government for a "base supply" of water from the CVP in place of water that would otherwise be taken from the Sacramento River under riparian and pre-1914 appropriative water rights. Their "base supply" is subject to shortages of no more than 25 percent based only on the total annual inflow to Shasta Reservoir. However, the Sacramento River Water Rights Contractors' settlement contract is not perpetual, and will expire in the year 2016. It is likely that the USBR will probably seek to revise the shortage criteria at that time. Also, any transfer water obtained from sources that are tributary to the Sacramento-San Joaquin Bay Delta Estuary will be subject to significant environmental requirements, including dedication of a portion of the transfer water for fish and wildlife purposes. Because "base supply" involves a water rights settlement, rather than an exchange of CVP water, transfers of "base supply" are subject to approval of the State Water Resources Control Board rather than the USBR.

Other sources of transfer water within the CVP are primarily irrigation contractors. CVP irrigation water, whether upstream or downstream of the Delta, is subject to significant shortages. Even if irrigation water is transferred for M&I use, it should be expected to retain the relatively low reliability of its original purpose. If a transfer of water from irrigation to M&I is envisioned to be permanent, then the USBR has proposed that it be accomplished through contract amendments, with adjustments in contract quantities made to establish the M&I status of the water.

State Water Project Transfers

Prior to the negotiation of the "Monterey Agreement" on December 2, 1994, a number of SWP contractors had transferred water in short-term agreements, and DWR had approved such transfers on a case-by-case basis. There were no formal policy guidelines addressing transfers of SWP water, except for a general "golden rule" concept that transfers by one State Water Contractor could not jeopardize the water supply or financial conditions of other nonparticipating State Water Contractors, and that any approved transfer would not be considered as a precedent for future transfers.

During the most recent drought, agricultural contractors suffered severe shortages in supply, which made it difficult for them to cover the fixed costs associated with their SWP entitlements. A number of SWP contractors sought to sell portions of these entitlements. As a result of the agricultural contractors' drought-related financial problems, the DWR and the State Water Contractors began to consider a number of alternatives, including rules for transfer of entitlement, methods of short-term water marketing among SWP contractors, and proposals to modify the SWP agricultural and M&I water shortage criteria.

In December 1994, the SWP Contractors including Ag Contractors, Urban Contractors, and DWR completed the Monterey Agreement to resolve disputes regarding water allocation and changes in the operational and financial control of the SWP. The largest dispute focused on the cutbacks that Ag contractors had to make before any of the other contracts were impacted. The major principles of the Monterey Agreement are discussed in Chapter 5. With respect to long-term water transfers, the Monterey Agreement provides for the sale and permanent assignment of 130,000 af of water from SWP agricultural contractors in Kern County to M&I contractors. The District has expressed interest in participating in this sale and is evaluating potential benefits and costs.

Independent Transfers

Independent transfers involve the purchase of water from agencies or individuals who divert water under their own appropriative water rights, independent of the CVP and the SWP. Appropriative water rights are granted by the SWRCB to agencies or individuals who have demonstrated that they have the ability to divert a supply of water and put it to beneficial use, and that this supply is a quantity in excess of that needed by riparian right holders and preexisting appropriative right holders. The California Water Code allows appropriative water rights holders to transfer their water to another water user without fear of forfeiture if statutory procedures which govern approval of transfers are followed. However, many water rights holders are reluctant to enter into long-term transfer agreements or to enter into short-term agreements for 5 or more consecutive years.

Short-Term Water Transfers

The approval process for a short-term or "spot market" water transfer is substantially less involved than that required for a long-term water transfer. However, short-term water transfers are subject to uncertainties with respect to environmental requirements and costs.

Short-term water transfers involve an agreement to purchase water within a period of 1 to 5 years. If the time period involved is one year or less, the approval processes required by federal and state agencies are generally minimized and substantially less than those required for long-term water transfers. The District has used a variety of short-term transfers to mitigate the impacts of recent drought years.

Although there is substantial uncertainty involved in the financial or other conditions that may apply to future short-term, or "spot market" transfers, they are always available at some price as a contingency tool in annual water supply planning. One of the purposes of the District's supplemental water fund is to ensure that funds will be available for short-term water transfers if needed. Short-term water transfers can be obtained from the State Drought Water Bank, if one exists in the year water is needed, from other CVP or SWP contractors, or from independent water rights holders.

State Drought Water Bank

In February 1991, as the State entered its fifth consecutive year of drought, Governor Wilson established the Drought Action Team. One of the recommendations of this team was to create an emergency drought water bank (Bank) which would facilitate the purchase and transfer of water from areas of the state with excess supply to those areas in need of additional supply. DWR was responsible for operating the Bank.

During 1991, the Bank purchased a total of 820,805 af through 351 contracts for $125 per af. About 51 percent of water bank supplies came from fallowing farmland, 32 percent from groundwater, and 17 percent from stored water. About 400,000 af was sold to cities and water districts and 270,000 af was stored in Lake Oroville for the following year. Most of the remaining 160,000 af was used to maintain Delta salinity standards. The District purchased 19,750 af from the Bank for $175 per af at the SWP's Banks Pumping Plant near Tracy.

Additional conveyance costs were $50 per af, for a total cost of $225 per af.

In March 1992, Governor Wilson announced the continuation of the Bank, and more than 143,000 af of water was purchased for $50 per af. The District did not participate in the 1992 State Bank. In 1993, water supplies available throughout the State increased substantially, and it was not necessary to establish a State Bank. In 1994, the State Bank was activated again, and the District purchased 5,000 af from the Bank at the cost of $50 per af plus conveyance costs.

The State Bank demonstrated the effectiveness of transfers to meet short-term water needs, and it is likely that a modified form of the State Bank will continue in the future as a mechanism to facilitate short-term transfers during drought years. One important impact that the State Bank had on the short-term transfer market was that it stabilized the price of transfer water. For future State Banks, it is likely that DWR will have to complete additional environmental documentation, since concern over the potential for cumulative impacts of short-term transfers was expressed.

Although the State Bank represents an important option for the District in a critically dry year, there is a risk that the District will not be able to obtain all the water it needs from the Bank. The highest priority of the Bank is to provide water for "extreme critical needs," which include "domestic use, health, sanitation, and fire protection." After extreme critical needs are met, water is allocated through a "levelling" process to meet the remaining needs of Ag and M&I water users. M&I participants must be able to show that they are making maximum use of available water supplies, have total water supplies of less than normal demand, and have a voluntary or mandatory water rationing program in effect.

In addition to the risk that the District's purchases may be restricted by the critical needs of other banking participants, there is also the risk that the State Bank may not be in existence during a year in which the District needs to buy water or may not be able to purchase sufficient supplies to meet all of the needs. The Bank may not be operated if statewide hydrologic conditions are "normal," and yet, if local conditions are dry or the District wants to rebuild groundwater storage, these may be years in which the District may still wish to supplement its imported water supplies.

State Water Project Short-Term Water Purchases

The recent drought prompted the DWR and various SWP contractors to establish a Water Purchase Committee that will, through the DWR, buy transfer water on behalf of SWP contractors. DWR is completing the environmental requirements for future water purchases and working with the SWP contractors to determine whether an appropriate contract amendment can be developed that will allow for cost recovery of short-term water purchases over a 3- to 5-year period.

DWR and the SWP contractors developed a one-year agreement and purchased water for use in 1994. The 1-year water purchase agreement required less environmental documentation and serves as a pilot program for possible future longer-term purchases by the Water Purchase Committee. On March 28, 1994, the District's Board of Directors approved participation in the 1994 Water Purchase Committee to negotiate a 1-year Water Purchase Program. The District subsequently purchased 9,000 af under this program, and after conveyance losses received 7,380 af. The estimated cost of water that actually delivered to the District was $67.5 per af at the SWP Bank's pumping plant, plus an additional conveyance cost at about $40 per af to the District's turnout.

Other Recent District Short-Term Water Transfers

In 1989, the District via DWR purchased from the Yuba County Water Agency 90,000 af of water, which was subsequently stored in San Luis Reservoir and used in 1989, 1990 and 1991 to alleviate the impacts of the recent drought. In 1991, the District purchased and transferred about 17,000 af of water from Placer County Water Agency. Due to carriage water losses through the Delta, the amounts of Yuba County and Placer County water delivered to the District were about 69,000 af and 14,000 af, respectively. All of the water was delivered to the County through the SWP facilities. The cost of purchasing Yuba County water was $45 per af, and for Placer County water, $100 per af. After losses and conveyance costs were included, the total costs to the District were approximately $110 per af for the Yuba County water, and $180 per af for the Placer County water.

In addition, the District entered into a one-year option agreement with Dudley Ridge Water District, another SWP contractor, in 1993 for transfer of up to 30,000 af. Due to the availability of other supplies in 1993, the District did not use this option.

Changes to Water System Operations

The District's existing operational priorities and modifications to current operations that could provide additional water supply reliability for the County are discussed below. These modifications include using imported water before local water, storing imported water in local reservoirs, and the District becoming the master contractor for the County's Hetch-Hetchy water.

Prioritizing Imported Water Over Local Water

Historically, the District has utilized its local water supplies before its imported supplies for four major reasons. First, the local supplies have the lowest unit cost, about $48/af, versus imported water at about $228/af, all in 1995 dollars. Second, unless the local water is used, the following year's runoff could potentially fill the reservoirs which could then spill water to San Francisco Bay. Third, the imported supplies are expected to be used at the treatment plants and any excess imported deliveries are intended to augment local water

Changes to the District's existing water supply system operations include prioritizing imported water over local water, greater utilization of Hetch-Hetchy supplies, expansion of Rinconada WTP, and a new South County WTP. All of these options require further studies to determine their water supply benefits.

supplies by recharging the groundwater basin. And finally, the historical operation of the local reservoirs has provided incidental flood control storage for the valley.

By prioritizing the use of imported water over local water, the District could utilize more of its imported water deliveries through a wider range of hydrologic conditions. Essentially, more imported water would be used during wet hydrologic periods when its availability is greatest. This would result in additional local water being stored in the District's reservoirs. The local water could then be released to augment the imported water deliveries to the percolation facilities and treatment plants. During the design CDP with this change in operation, it is estimated that the County's need for additional supply could be reduced by 15,000 af/year based on the CVP M&I Shortage Policy with the historical three years average water use.

Any local water left in the reservoirs would remain as carryover storage and act as a supply buffer for any future drought period. But because the carryover storage would be greater, additional local water may spill to San Francisco or Monterey Bay. Until the major creeks of the County are modified to pass a 1-in-100-year flood event, a change in reservoir operation may increase the potential for localized flooding.

Storing Imported Water in a Local Reservoir

Another operational change that could benefit the County's water supply would be to use Anderson or Calero Reservoirs as storage facilities for imported CVP deliveries or water transfers. Water in either reservoir could be used as a buffer for future dry periods. Utilizing available storage increases the District's ability to use its imported CVP supplies through a wider range of hydrologic conditions and maximizes CVP deliveries for the benefit of the CVP M&I Shortage Policy. Again, this would result in greater carryover storage to buffer future droughts.

The disadvantage of using Anderson or Calero reservoirs for imported water storage facilities is the increased potential for localized flooding. With more carryover storage comes increased frequency and magnitude of spilling. Operational studies indicate that on the average, spilling of local water from the Coyote Creek watershed would increase by 6,300 af/year and would occur an additional 16 times over the 31-year historic period of study. In contrast, with the addition of a pumping plant at Calero, the spilling of local water could be eliminated.

Coordination With SFWD for Greater Utilization of Hetch-Hetchy Supplies

The SFWD administers the delivery of Hetch-Hetchy water in Santa Clara County through long-term contracts with nine different agencies. The agencies receiving Hetch-Hetchy water in the County include service areas in the cities of Milpitas, Mountain View, Palo Alto, San Jose, Santa Clara, Sunnyvale, Purissima Hills Water District, and Stanford University. The estimated long-term average annual deliveries are 63,800 af/year. The cities of San Jose and Santa Clara have interruptible supply contracts whereby SFWD can discontinue deliveries to the two cities with a 2-year notice.

These deliveries represent approximately 11,500 af/year of supply to the County. The Hetch-Hetchy aqueduct has an intertie with the SBA. Conceivably, the District could receive excess Hetch-Hetchy water supplies or transfer supplies to the aqueduct via the SBA. An intertie is also being planned from the District's Milpitas pipeline to the Hetch-Hetchy aqueduct for short-term transfers of emergency supplies.

All cities in Santa Clara County receiving Hetch-Hetchy water must be able to depend on this source as a firm, reliable supply. The District believes that there is potential for Hetch-Hetchy water deliveries to be managed in conjunction with the District's supplies to increase the long-term reliability of the County's total water supplies. During the recent drought, the District developed mandatory conservation goals to temporarily reduce the County's need for water. Since then, other permanent water-saving programs have been developed. They include non-potable recycling, the Ultra-Low-Flush Toilet (ULFT) rebate program, and low-flow showerhead programs. These efforts are Countywide and include those cities that receive both District supplies and Hetch-Hetchy water. One of the results of the District's investment in conservation efforts is a demand reduction in the Hetch-Hetchy service area. The Hetch-Hetchy water that is conserved through these programs increases the yield of the Hetch-Hetchy system and can be delivered to other Hetch-Hetchy contractors within or outside of the County. Hetch-Hetchy water saved through the District's programs could be used conjunctively with the District's supplies to supplement treated water supplies or recharge the groundwater basin, thereby increasing the long-term reliability of the County's supplies.

Expansion of Rinconada Water Treatment Plant

The expansion of Rinconada WTP may provide a water supply benefit to the District in the form of reduced future water transfer requirements. It may be difficult for the District to meet the future water needs of the County's northwest area due to the area's growing water demands and the inability of the groundwater subbasin to meet that demand.

An expanded Rinconada WTP would provide additional system capacity, increasing the operational flexibility of the northwest portion of the District's system.

Rinconada WTP suffered significant damage during the 1989 Loma Prieta earthquake and was able to remain operational after the earthquake because a portion of the plant had not been operating at the time of the temblor. Rinconada WTP was more vulnerable than the District's other two plants because the process equipment at the plant is on the surface and not submerged as it is in the other plants. Expansion of the Rinconada WTP with new submerged process equipment would provide greater reliability in the event of the earthquake.

New South County Water Treatment Plant or Additional Recharge

The 1975 Master Plan recommended that a new WTP be considered as an alternative to meet South County future water needs. At that time, the decision whether to build this plant was deferred because it depended upon refining water demand projections for South County and determining the operational capability of the Llagas groundwater basin. Subsequently, the District evaluated alternatives to meet South County water demands in a 1983 report. The recommendation of this report was to add recharge facilities to utilize only the groundwater basin to meet the projected water needs of the area. However, the report did not eliminate the possibility that a WTP may be required in the future. It recommended periodic reevaluation of the recharge alternative, especially if groundwater quality should deteriorate to an unacceptable level or if the basin did not have the capacity to recharge and transmit the anticipated quantity of water needed.

More detailed studies have been performed to estimate the recharge capability of the sites identified in the 1983 report. These studies found that the recharge capacities of these identified sites were lower than was estimated, and the existing facilities in South County plus the proposed new recharge ponds will not be able to meet the area's projected future water needs. Consequently, either additional recharge sites or a new WTP will be needed in the South County. Operational studies have shown that South County water needs can be met without overdrafting the groundwater subbasin if a new 25 mgd South County WTP is built. The amount of supplemental water supply needed for the additional recharge alternative is approximately the same as that required for a new WTP. Therefore, at this stage, it appears that the two options are comparable.

Chapter 7
DEMAND MANAGEMENT OPTIONS

This chapter provides an overview of the District's existing water conservation, or demand-side management (DSM) program and its anticipated impacts. It also evaluates the potential savings, costs and implementation characteristics of additional DSM opportunities. The chapter concludes with an overview of future work required to monitor the continued effectiveness of existing activities and to fully implement new programs.

Background

In 1991, the District signed a Memorandum of Understanding regarding urban water conservation along with 200 other organizations in the state. This landmark agreement commits the District to implementing 16 water conservation Best Management Practices (BMPs) by the year 2002.

Programs and activities to decrease urban and agricultural water use are expected to be a permanent element of the District's water resource management strategy, due to a number of factors. The drought of 1987-1992 brought into sharp focus the need to use water efficiently. The reallocation of water for environmental uses in the Sacramento-San Joaquin Delta has forced both urban and agricultural water providers to improve the efficiency of their end users. Continued population growth within the state places an increasing burden on a finite resource.

In response to these developments, in 1991 the District joined with other water utilities, environmental organizations and public advocacy groups in signing the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). The MOU committed signatories to implement a series of 16 BMPs over a 10-year period (1991-2002). In 1992, Governor Wilson made implementation of the BMPs a condition of State Water Resources Control Board permit approval.

In 1992, the Central Valley Project Improvement Act (CVPIA) was passed into federal law. The CVPIA mandated that water contractors with the Central Valley Project develop and implement water conservation plans which conformed with criteria established by the USBR. These criteria include the full implementation of the Urban BMPs as well as additional agricultural Efficient Water Management Practices (EWMPs). As a result, the District now faces both state and federal mandates to implement DSM programs. These mandates are outlined in Table 7-1.

TABLE 7-1
State and Federal Water Conservation Mandates

Mandate	State/Federal	Required Element	Contingent Approval
Memorandum of Understanding	State	Urban BMPs	SWRCB Permits
State Water Policy	State	Urban BMPs	SWRCB Permits, Drought Bank
Urban Water Management Plan	State	Urban BMPs	SWRCB Permits, Drought Bank
Central Valley Project Improvement Act	Federal	Urban BMPs, Agricultural EWMPs	USBR-CVP Contract Renewal, Transfer Approval, etc.

The District's Current Baseline DSM Program

The District's current and planned demand management programs are expected to reduce demand for water by 46,100 af/year by the year 2020.

The District began its Water Conservation Program in 1991. The current program includes elements targeted to residential, commercial/industrial, and agricultural water use. Several of these elements have been developed in partnership with local retail water suppliers and with the City of San Jose. The program has received state and national recognition for many innovations. A comprehensive description of the District's existing program is located in Appendix J. It is worth noting that this program is essentially voluntary, relying on technical assistance, financial incentives, and education to influence customer decisions and behaviors.

The District's program has been developed in large part to comply with the BMP commitments described above. In addition to the elements that are directly linked to these obligations, staff is pursuing other demand-side opportunities. These opportunities are primarily in the residential landscape and commercial/industrial water use sectors.

In total, the current and planned elements of the District's existing program are expected to yield 46,100 af/year in water use reductions by 2020. Table 7-2 provides a breakdown of the estimated savings by sector. Program elements are described in detail below.

TABLE 7-2
Anticipated Water Use Reductions by Sector
(af/year)

Sector	2000	2005	2010	2015	2020
Residential Interior	12,900	19,200	22,500	22,300	22,300
Residential Exterior	5,800	9,700	12,000	13,400	13,400
Commercial/Industrial Interior	2,100	2,500	2,700	2,700	3,000
Commercial/Industrial Exterior	4,700	7,300	7,500	6,700	6,400
Agricultural	700	1,000	1,000	1,000	1,000
Total (af/year)	**26,200**	**39,700**	**45,700**	**46,100**	**46,100**

Residential Interior

This sector of water use will be a primary focus of District program activities. Measures targeted in this sector include ultra-low-flush toilets (ULFTs), low-flow showerheads, tumble-action washing machines, and other hardware retrofits in the home. Delivery methods could include residential water audits, financial incentives, direct distribution, and education.

Implementation of these programs is largely influenced by the District's commitments under the MOU. It is expected that this sector will be most aggressively targeted during 1992-2002. Program activities after the term of the MOU may focus on technology improvements in other water-using interior devices.

Residential Exterior

This also represents a significant area of focus for the District's program. Measures developed for this sector will include high-efficiency irrigation systems, automated controllers, climate-appropriate plant materials, water-efficient landscape design, and proper landscape maintenance practices. Delivery methods will include residential audits, financial incentives, public and professional training, education and outreach, and support for research and demonstration projects. The activities will likely be designed to achieve end-of-life replacement. This will result in slower implementation rates, but will reduce District costs.

Commercial/Industrial Interior

This sector is differentiated from all others by the extreme disaggregation of its water uses. Although there are strong similarities among certain users (office buildings, retail, etc.), many other types of business show unique water-use patterns. As a result, the measures targeted toward this sector are much broader and include ULFT, ultra-low-volume urinals, ultrasonic faucets, air-cooled drinking fountains, process water recycling, cooling tower modification, and improved control systems. Delivery methods could include commercial audits, design review, financial incentives, professional training, peer matching, recognition programs, and outreach and education.

Commercial/Industrial Exterior

Water conservation measures targeted towards this sector include efficient irrigation management, high-efficiency irrigation equipment, water-efficient landscape design, and improved measurement. Delivery mechanisms could include technical assistance, large-turf water auditing, financial incentives, design review, professional training, and support for research and development of water-efficient materials and technologies.

Agricultural

Activities targeted to this sector of water use are influenced by the CVPIA and the District's contract with the USBR. Although agricultural water use is a small part of the overall demand for water in the County and is already relatively efficient, the District is obligated to identify and encourage water-use efficiency improvements in this sector. Measures which will be targeted towards agricultural water users include operation of California Irrigation Management Information System (CIMIS) weather stations, pump efficiency testing, mobile irrigation labs, and financial incentives.

Evaluation of Additional DSM Opportunities

On the advice of Level 1 stakeholders, an aggressive outreach and education program will be part of the District's future DSM efforts.

The District is influenced in great measure by the requirements of the state and federal mandates under which it operates. These mandates have had direct impacts on the nature and scope of existing and planned water conservation program activities. Within these requirements, the District has optimized the design and administration of its programs to ensure they meet their intended goals and provide water savings in a cost-effective manner.

The District applied a similar process to identify and characterize new DSM opportunities. Several quantitative and qualitative screening criteria were employed by an evaluation team comprised of District program staff and local retail water suppliers. These criteria included technical potential, ease of implementation, and effect on demand hardening as discussed below. Each of these areas was significant to the selection process, and an alternative that performed poorly in one or more of them was not likely to be considered. A description of each criteria follows.

Technical Potential

This is a qualitative criterion which addresses the adequacy of the proposed technology. Does it function reliably? Is there confidence in the measure life? Is it an appropriate retrofit in a majority of installations? Are there adverse secondary impacts to the technology?

Ease of Implementation

This is a qualitative criterion which addresses the relative acceptance of a particular measure by the target audience.

Demand Hardening

This is a qualitative criterion which addresses the belief that all long-term DSM programs have some impact on the ability of water-users to respond during periods of drought. This reduced flexibility is referred to as a "hardened" demand for water. Programs with short lead times or which focus on behavioral changes have high demand hardening impacts. Those programs which have long lead times and could not be implemented during periods of shortage have low demand hardening impacts.

The quality and availability of certain water use data at this time limits the scope of this evaluation process. As a result, the screening process provides what can be described as a reconnaissance-level evaluation of DSM opportunities. This evaluation has indicated three sectors in which additional savings are available: residential interior, residential exterior, and commercial/industrial interior. These are described in detail below.

Additional DSM Opportunities by Sector

The following section describes the most promising opportunities for additional water use reductions.

Residential Interior

Since this sector is already the focus of considerable attention in the existing program, additional opportunities are limited. Technologies which possess additional potential include high-efficiency dishwashers and point-of-use water heaters. A summary of these residential interior measures appears in Table 7-3.

TABLE 7-3
Residential Interior Water Use DSM Measures

Measure Description	Potential Savings	Technical Potential	Ease of Implementation	Demand Hardening
High-Efficiency Dishwashers	400 af/year	High	Medium	Low
Point-of-Use Water Heater	2,200 af/year	Low	Low	Low

Implementation of additional voluntary program elements which feature current technology could increase efficiency in this sector by less than 1 percent over baseline activities. Other opportunities may become apparent over time as technologies change and evolve: for example, the 1-liter-per-flush toilet, which is currently available in Europe but not in the U.S.

Residential Exterior

This sector is capable of additional reductions. However, there are significant cost, technical, implementability, and demand hardening impacts to be considered. A summary of the potential residential exterior measures appears in Table 7-4.

TABLE 7-4
Residential Exterior Water Use DSM Measures

Measure Description	Potential Savings	Technical Potential	Ease of Implementation	Demand Hardening
Residential New Construction: Water Efficient Landscaping	5,000 af/year	High	Low	High
High-Efficiency Irrigation Retrofits	1,500 af/year	Med	Med	High

Commercial/Industrial Interior

Some additional DSM opportunities appear to exist in this sector. As with the other sectors, questions regarding cost, implementability, and demand hardening exist. In addition, water use in this sector is extremely disaggregate. This increases the difficulty of developing and administering water conservation programs. The potential commercial/industrial interior measures are listed in Table 7-5.

TABLE 7-5
Commercial/Industrial Interior Water Use DSM Measures

Measure Description	Potential Savings	Technical Potential	Ease of Implementation	Demand Hardening
High-Efficiency Process Retrofits	1,400 af/year	Med	Low	Low
Plumbing Retrofits	2,700 af/year	High	Med	Low

Other Alternatives

In addition to the measures described above, other alternatives may provide additional DSM opportunities. These may include non-technological measures which influence the decision-making of end users or other groups. Such opportunities include developer demand offsets. This is a regulatory measure designed to reduce current water use in order to offset future demand from new development. Demand offset regulations would require developers to replace old and inefficient fixtures or to fund other DSM activities by existing customers to secure water for serving new development.

Implementation of a demand offset program could reduce future demands by an estimated 12,000 af/year.

Composite Program Alternatives

To facilitate the comparison of demand management options against supply options, the individual measures listed above were grouped into two program alternatives. The program alternatives build on the actions contained in the District's current baseline program. Each program reflects a theme. Program 1 is based on voluntary participation by water users. Program 2 is a mandatory program utilizing code changes to achieve implementation. A brief description of the programs follows.

- **Baseline.** This voluntary program includes all of the District's current and planned demand management measures. The program is expected to yield 46,100 af/year in water use reductions by 2020.
- **Program 1.** Includes all of the baseline program. In addition, it introduces voluntary programs (incentives, technical assistance, education) to increase penetration levels for technologies primarily in the residential landscape and commercial/industrial interior sectors. Program 1 also includes pilot programs for water-efficient dishwashers. In general, this program is expected to have a higher per-unit cost, and require more District effort, than the baseline. This program is expected to yield an additional 11,000 af/yr in water use reductions beyond the baseline by 2020.

  Program 1 has a higher level of risk because it relies more heavily on the community to implement demand-management measures. Program 1 also requires a larger expenditure than the baseline program.
- **Program 2.** Includes all of the elements contained in the baseline and Program 1. In addition, Program 2 includes two new measures, point-of-use water heaters for residential new construction, and developer demand offsets. Developer demand offset programs are included as a possible solution to intergenerational equity issues raised during the stakeholder process. This program is expected to yield an additional 25,000 af/year in water use reductions beyond the baseline by 2020.

  Program 2 has the highest level of risk due to the reliance on code changes as the implementation mechanism. Program 2 also shifts the burden of cost almost entirely on the community, and results in the highest level of demand hardening.

Table 7-6 provides a breakdown of the various measures which would be included in the program alternatives described above. Table 7-7 provides a summary of the estimated costs and savings of the three program alternatives. A summary of savings potential for each program alternative follows in Figure 7-1.

TABLE 7-6
DSM Program Alternatives

Baseline: Existing Program	2020 Estimated Yield (af/yr)
1. Residential Audits	300
2. Showerhead Retrofits	2,300
3. Tumble-Action Washing Machine Retrofits	5,200
4. Ultra-Low-Flush Toilet Retrofits	14,500
5. Large-Landscape Technical Assistance	300
6. Commercial/Industrial Audits	3,000
7. Commercial/Industrial Financial Incentives	
8. Commercial/Industrial Education and Training	
8. Residential Landscape Education & Training	19,500
9. Residential Landscape Financial Incentives	
10. Residential Landscape Ordinance	
11. Agricultural Efficient Water Management Practices	1,000
Program 1: Voluntary Program	
Baseline Plus:	
1. Enhanced Residential Landscape Financial Incentives	1,500
2. Enhanced Commercial/Industrial Audits	1,400
3. Enhanced Commercial/Industrial Financial Incentives	2,700
4. Low-Volume Dishwasher Retrofits.	400
5. Residential New Construction: Water-Efficient Landscaping	5,000
Program 2: Regulatory Program	
Program 1 Plus:	
1. Residential New Construction: Point-of-Use Water Heater	2,200
2. Developer Demand Offsets	12,000

TABLE 7-7
Savings Estimates of Program Alternatives

	Baseline	Program 1	Program 2[1]
Maximum Annual Savings (af/year)	46,100 af/year	11,000 af/year over baseline	25,200 af/year over baseline

[1] Program 2 includes Program 1.

Level 1 stakeholders suggested that future DSM programs might seek water use reductions in areas outside the District's service territory—in effect seeking to transfer conserved water to the District as a new source of supply. Such conservation-for-water "swaps" have occurred in Southern California between urban and agricultural water agencies.

Future Work

Additional work will be necessary to fully implement the programs described above and to monitor the continued effectiveness of existing activities.

Improved Data

Improved data has been identified as a core element. Improvements in the quality and availability of data will be required to better develop detailed demand management implementation plans. Specific areas of need include:

- Water use breakdowns by classification (residential single-family, residential multi-family, commercial, industrial, etc.) which are consistent throughout the County.
- End uses by customer class.
- Penetration rates for targeted technologies.

The availability of this data is essential for the evaluation of program impacts and to refine program design. Currently, available data is not adequate for these purposes. Improving the availability of water use data could be addressed in a demand management master planning process.

Level 1 stakeholders expressed a desire to protect those who already conserve water from penalties during periods of shortage. Designing future policies and programs to ensure equity between conservers and nonconservers will require cooperation between the District and retail water suppliers.

Shortage Management Strategy

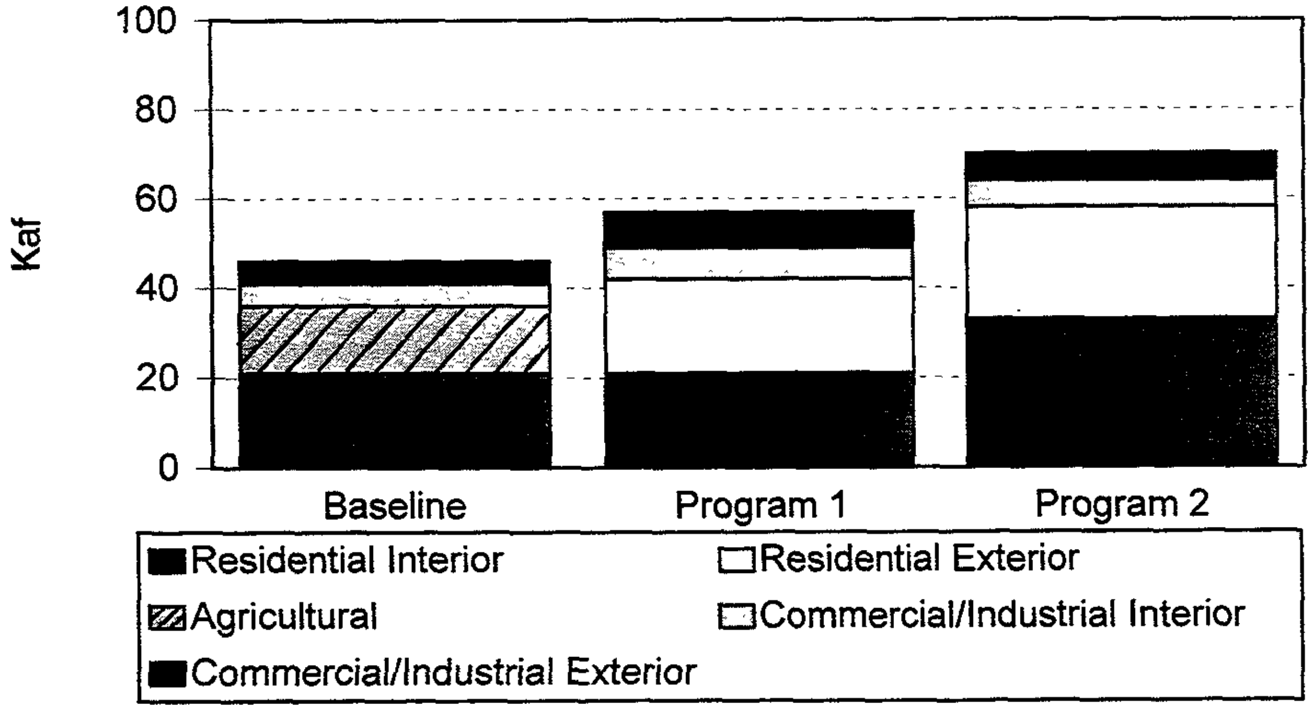
Analysis is required to determine the impacts of long-term DSM programs on the ability of water users to react during periods of water shortage. This analysis should focus on several issues:

- The effect of various DSM measures on demand hardening. This evaluation should also consider differences in demand hardening among various sectors of water users.

- Equity between conservers and nonconservers. Should water users who have become more efficient receive special treatment (preferential rates, less severe allocations, etc.) during periods of shortage? Should retail water suppliers who participate more aggressively in DSM programs receive priority over nonparticipants?
- Future rationing strategies. It is recognized that rationing programs must reflect new water-use patterns. Such strategies might be part of a basin management plan.

Plans to address these issues will likely be a component of the next phase of planning, to begin after the conclusion of the current IWRP process.

FIGURE 7-1
Savings Potential of Program Alternatives



Chapter 8
THEMATIC WATER RESOURCE STRATEGIES

This chapter describes various "thematic" water resource strategies that were developed from the supply and demand-side management options presented in Chapters 6 and 7. Thematic strategies are collections of various options which emphasize different themes, such as local storage or water banking.

The first part of this chapter describes the screening process performed on all of the options to assess their viability for further consideration and use as components of resource strategies. The second part discusses the thematic strategies and the evaluation process District staff used to determine how well the strategies met the IWRP planning objectives.

Resource Options Screening

The full range of supply and demand management options described in Chapters 6 and 7 were evaluated by District staff using the rating guidance explained in Chapter 4 (see Table 4-2). The options were rated based on five planning objectives which were identified as most suitable for the component screening process:

- Maximize Flexibility to Meet Changing Water Supply and Demand Conditions
- Minimize Risk of Providing Supplies
- Minimize District Costs
- Maximize the Quality and Treatability of Source Water
- Avoid or Minimize Adverse Impacts to Habitats or Ecosystems

The options that best satisfied these five planning objectives were identified as "most promising" for assembly into resource strategies. Options identified as less promising were placed on hold for future consideration. None of the options was excluded from the process.

The options, their CDP yields, and their status are summarized in Table 8-1.

TABLE 8-1
Option Screening Results

Supply Options	CDP Yield (af/yr)	Most Promising	Held for Future Consideration	Excluded	Reason(s)
LOCAL SUPPLIES					
Non-potable Recycled Water	36,000	X			High cost with high CDP yield and less environmental impacts. No change in water quality. Increases District's system flexibility.
Recycled Water for Groundwater Recharge	25,000	X			High cost with high CDP yield and less environmental impacts. Potential risk of public acceptance and impact on groundwater quality. Increases District's system flexibility.
Recycled Water for Reservoir Blending	60,000	X			High cost with high CDP yield and less environmental impacts. Potential risk of public acceptance. Increases District's system flexibility. Requires retention time of recycled water in reservoir.
Export of Recycled Water	100,000	X			High cost with potential high CDP yield and less environmental impacts. No change in water quality and District's system flexibility. Uncertainty of exchanged potable water quantity.
Desalination	100,000		X		High cost with high CDP yield and high environmental impacts. High energy consumption. No change in water quality. Increases District's system flexibility.
Enlarge Stevens Creek Reservoir	500		X		High cost with low CDP yield. Requires lengthy permitting process. No change in water quality and District system flexibility.
Enlarge Calero Reservoir	200		X		High cost with low CDP yield. Requires lengthy permitting process. No change in water quality and District's system flexibility.

TABLE 8-1
Option Screening Results
(continued)

Supply Options	CDP Yield (af/yr)	Most Promising	Held for Future Consideration	Excluded	Reason(s)
Enlarge Uvas Reservoir	2,000		X		Medium cost with low CDP yield. Requires lengthy permitting process. No change in water quality and District's system flexibility.
Divert Uvas Water to Elsewhere	5,000		X		High cost with low CDP yield. Requires lengthy permitting process. No change in water quality and District's system flexibility.
Inflatable Dam	1,200		X		Low cost with low CDP yield. Requires lengthy permitting process. No change in water quality and District's system flexibility.
Additional Groundwater Yield	25,000		X		High subsidence risk, unknown quantity of water could be pumped below the subsidence threshold. Potential high cost due to subsidence.
Enlarge Anderson Reservoir	25,000		X		Medium cost with high CDP yield and high environmental impacts. Increases District's system flexibility by storing excess imported/local water during normal/wet years for use during CDP. Requires a lengthy permitting process.
New In-County Reservoir	50,000	X			Medium cost with high CDP yield and high environmental impacts. Increases District's system flexibility by storing excess imported/local water during normal wet years for use during CDP. Requires a lengthy permitting process.

TABLE 8-1
Option Screening Results
(continued)

Supply Options	CDP Yield (*af/yr*)	Most Promising	Held for Future Consideration	Excluded	Reason(s)
New Out-of-County Reservoir	50,000	X			Medium cost with high CDP yield and high environmental impacts. Increases District's system flexibility by storing excess imported water during normal/wet years for use during CDP. Requires a lengthy permitting process.
Upper Del Valle Reservoir	2,000		X		High cost with low CDP yield. No change in water quality. Increases District's system flexibility. Requires a lengthy permitting process.
Water Banking Program	45,000	X			Low cost with less environmental impacts. No change in water quality. Increases District's system flexibility. Water availability for banking is great during normal/wet years for use during CDP. Unknown restrictions in put/take. Potential adjudication of outside basin.
TRANSFERS/STORAGE					
State Drought Water Bank	20,000	X			Low cost with medium CDP yield and less environmental impacts. The Drought Bank only exists during drought years, and must have mandatory water restriction requirement prior to purchasing water from the Bank.

TABLE 8-1
Option Screening Results
(continued)

Supply Options	CDP Yield (af/yr)	Most Promising	Held for Future Consideration	Excluded	Reason(s)
Short-Term Water Transfers	55,000	X			Low cost with less environmental impacts. May have difficulties getting water during CDP. The purchased water is delivered via existing SWP or CVP to the County. No change in water quality and District's system flexibility.
Long-Term Water Transfers	100,000	X			Low cost with less environmental impacts. Uncertainty in obtaining long-term agreement. The purchased water is delivered via existing SWP or CVP to the County. No change in water quality and District's system flexibility.
CHANGE OF OPERATIONS					
Prioritize Imported Over Local Water	15,000		X		An option to improve current system operation. Potential flood control concerns. The option is suggested for investigation in future study.
Store Excess Imported Water	15,000		X		An option to improve current District supply reliability with regards to excess imported water that could be stored in local reservoirs for use in dry periods. This option is suggested for investigation in future studies.
Coordinate with SFWD for Hetch Hetchy Supply	N/A		X		An option to improve current District's supply reliability with regards to Hetch-Hetchy water supply in the Santa Clara County. Suggested for investigation in conjunction with SFWD continuously for the firm supply.

TABLE 8-1
Option Screening Results
(continued)

Supply Options	CDP Yield (af/yr)	Most Promising	Held for Future Consideration	Excluded	Reason(s)
New/Additional Water Treatment Capacity	N/A	X			An option to preserve local groundwater supplies for dry years by switching existing groundwater use to surface water use during average and wet years. Switching to surface water use in South County may improve water quality.
Demand Options	**CDP Yield(af/yr)**	**Most Promising**	**Held for Future Consideration**	**Excluded**	**Reason(s)**
CONSERVATION PROGRAM					
Demand Management Program 1	11,000	X			Low cost with minimal environment impact. No change in water quality. Slightly higher community impact than baseline. Uncertainty associated with user implementation.
Demand Management Program 2	34,700[1]	X			Low cost with minimal environment impact. No change in water quality. Slightly higher community impact than Program 1. Risk associated with implementing legislative and code changes.

[1] Includes graywater element which was subsequently dropped, resulting in a CDP yield of 25,200 af/yr.

Most Promising Options

The 13 most promising options identified are:

- Non-potable Recycled Water
- Recycled Water for Groundwater Recharge
- Recycled Water for Reservoir Blending
- Export of Recycled Water
- New In-County Reservoir
- New Out-of-County Reservoir
- Water Banking Program
- State Drought Water Bank
- Short-Term Water Transfers
- Long-Term Water Transfers
- New/Additional Treatment Capacity
- Demand Management Program 1
- Demand Management Program 2

Options Held for Future Consideration

The following options were held for future consideration. At any time in the future, they may show additional merit that would suggest they could be revisited.

Capturing Additional Local Streamflows. Each option in this category (enlarging Stevens Creek Reservoir [500 af], enlarging Calero Reservoir [200 af], enlarging Uvas reservoir [2,000 af], diverting Uvas water elsewhere [5,000 af], and inflatable dams [1,200 af]) offers minimal CDP water (low operational flexibility) to justify the implementation and permitting obstacles (high risk). As a group, these options represent a CDP yield of approximately 9,000 af.

Desalination. A desalination plant would be very expensive and would have very high environmental impacts associated with brine disposal. The risk of developing a plant with anything near the CDP yield contemplated here (100,000 af) is very high; nowhere in California has the technology been used to this level. (See Page 6-7).

Additional Groundwater Yield. Additional groundwater yield (25,000 af), requiring the withdrawal of water from below the subsidence threshold level, would have a very high risk and subsequent environmental and community impacts.

Enlarging Anderson Reservoir. With a CDP yield of 25,000 af, this option would offer increased operational flexibility by allowing the District to store additional local and imported water during normal and wet years for use during the CDP. However, the upstream impacts may be unacceptable, including the flooding of potentially contaminated soils and impacts associated with inundating a nearby residential area. Risk issues also exist, including increased potential for landslides or rockslides, and the resultant possible road closures and overtopping of the dam.

Upper Del Valle Reservoir. This small facility (2,000 af CDP yield) would have the same implementation obstacles as a much larger facility, but at a relatively high cost for a relatively small yield. The high risk associated with implementation may not be justified for the low increase in operational flexibility.

Changes to System Operations. Three of the options that involve changes to system operations (prioritize imported water over local water, store excess imported water, and coordinate with San Francisco Water District for Hetch-Hetchy water) were held for future consideration. They do not represent capital projects; they represent policy decisions that may be superimposed over any alternative as part of a long-term implementation strategy. These may be revisited sooner than some of the other options in this "hold" category.

Thematic Resource Strategies

District staff chose from the most promising options to formulate eight IWRP strategies that attempt to meet the high end of the identified need for water in the year 2020 (500,000 af) and supply the estimated 100,000 af shortage that could be experienced during a CDP. Each strategy was developed as a theme incorporating similar components in order to uncover potential benefits or deficiencies associated with using these components either exclusively or nearly exclusively.

Core Elements

All strategies include the following core elements, which are actions and activities of existing programs:

I. Actions to Ensure Validity of Baseline Assumptions

- Achieving 46,000 af/yr conservation.
- Achieving 14,400 af/yr non-potable recycling
- Establishing an M&I shortage policy for CVP supplies.
- Protecting reliability of SWP, CVP, and Hetch-Hetchy supplies.
- Protecting existing resources and monitoring potential impacts.
- Implementing programs to seek improvements in source water quality, protect quality of existing resources, and improve treatment capability.
- Improving data collection and evaluation.
- Expanding and upgrading Rinconada Water Treatment Plant from 80 to 100 mgd to meet anticipated capacity requirements.
- Adding recharge or treatment capacity for South County.

II. Actions to Monitor and Evaluate Resource Options

- Investigating water marketing opportunities.
- Investigating future storage options.
- Investigating increased recycling opportunities and the distribution of costs and benefits.
- Investigating opportunities to improve the reliability of imported water supplies.
- Investigating other resource options that have been held for future consideration.

III. Actions to Help Meet Objectives

- Assessing system vulnerability.
- Continuing public interaction.
- Investigating system re-operation to improve efficiency.

Strategy Descriptions and Evaluations

A summary of the eight thematic strategies is presented in Table 8-2. The strategies are also presented in chart form in Figures 8-1 through 8-8 to display how each would meet projected future demands given historic water supplies.

District staff used the evaluation methodology described in Chapter 4 to determine how well or how poorly each thematic strategy met each of the 13 original planning objectives; these evaluations are described below. (Objectives 3 and 7 were added subsequent to this evaluation.) If a strategy met the planning objective well, it rated high; if a strategy met the planning objective poorly, it rated low. A nine-point system was created by allowing ratings to be modified with pluses (+) and minuses (-). The actual ratings ascribed to each strategy and brief explanations for each rating are provided in Appendix F.

TABLE 8-2
Summary of the Eight Thematic Strategies

Thematic Water Resource Stragies[1]	Demand Management	Rationing	Nonpotable Reuse	Potable Reuse	New Treatment Plant in South County	Expand Treatment Plant	Prioritize Imported Water	New Surface Storage	Water Banking	Long-Term Water Transfers	Short-Term Water	Demand Shortfall
1. Baseline												Yes
2. Demand Management	✓											Yes
3. Recycled Water			✓	✓								No
4. Maximize Local Storage					✓	✓	✓					Yes
5. New Surface Storage								✓				Yes
6. Water Banking									✓			Yes
7. Long-Term Water Transfers										✓		No
8. Short-Term (As Needed) Water Transfers		✓									✓	No

COMPONENTS (spans all component columns above)

[1] All strategies include Core Elements.

It is important to note that the strategies were rated relative to one another. For example, a low rating in the environmental category may not mean that implementation of the strategy would be detrimental to wildlife and habitat, but that at least one of the other eight strategies is considered to present fewer impacts to wildlife and habitat.

Thematic Strategy 1: Baseline

This strategy assumes all of the core elements are implemented, and no further measures are undertaken.

Compared with other strategies, implementation of the baseline strategy was rated lowest in terms of level of service: with no measures beyond the core elements, the greatest shortages of supply would occur. Demand is not met in all years, as shown on Figure 8-1. This is also considered among the least flexible of the strategies because no new conveyances for water distribution would be sought.

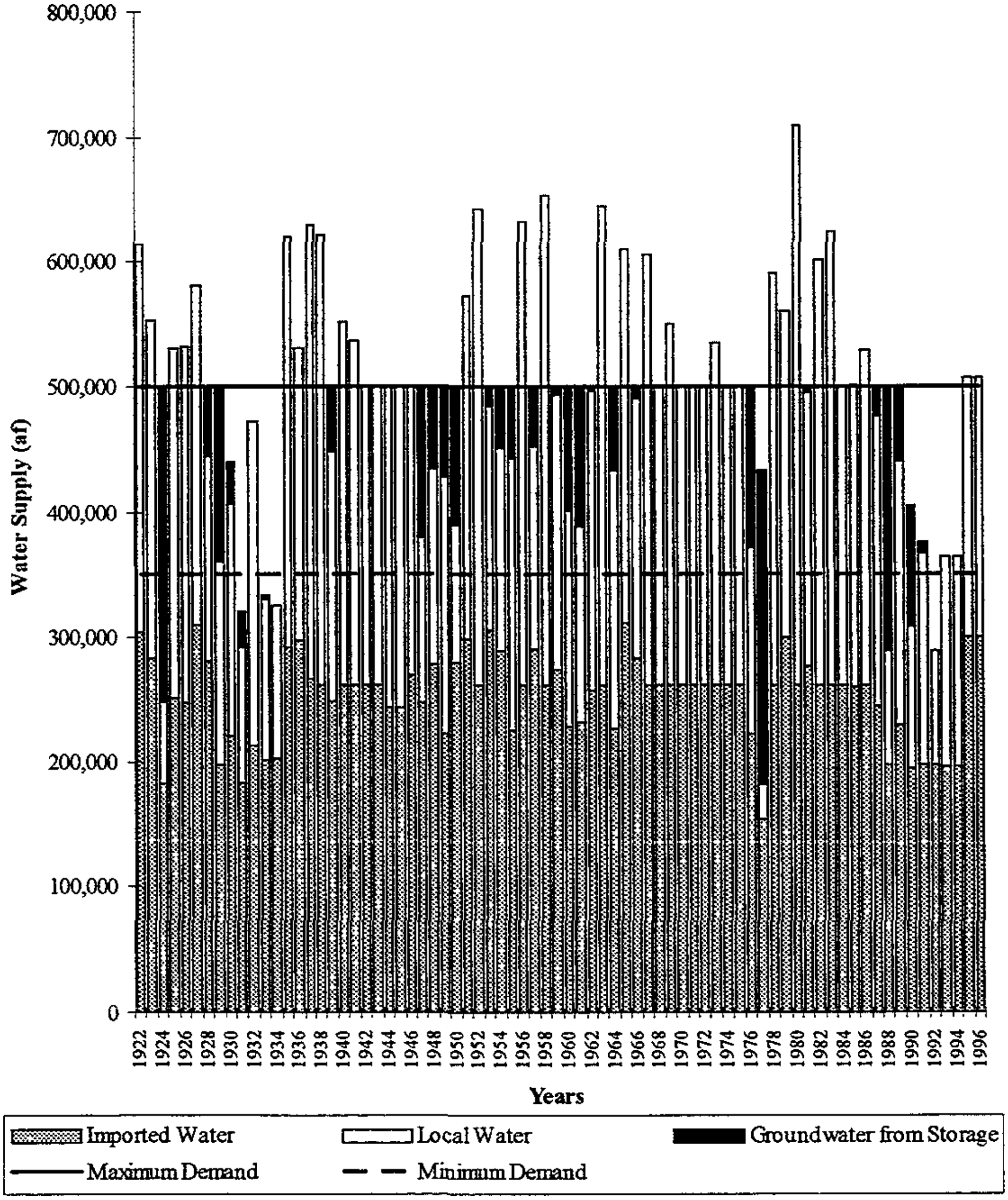
This strategy does not minimize risk since it may induce subsidence in consecutive dry years as the groundwater basin would be vulnerable to overdrafting during CDPs. Therefore, the risk associated with providing supplies is somewhat higher as compared with other strategies.

Economically, this strategy has low cost, because no capital expenditures would be undertaken. The only expenditures that would be experienced would be those related to public relations efforts to promote conservation in the reasonably probable event of supply shortage(s).

This strategy rated medium to low in meeting the community interest objectives primarily because of the anticipated supply shortages that would likely occur. The community would not be amenable to severe shortages and may suggest that District planning efforts had not been adequate in predicting and preparing for shortages. Reservoirs would experience significant draw down during CDPs that would have adverse impacts on recreational uses.

The hydrologic characteristics of this alternative would be similar to some natural cycles. Therefore, lower reservoir levels would likely result, but overall, this alternative would have only a moderate effect on the environment.

Figure 8-1
Water Supply Impact of Strategy 1 (Baseline)
Based in Historic Supply Data



Thematic Strategy 2: Demand Management

In addition to the core elements, this strategy would include an aggressive water conservation program, assumed to reduce demand by 34,700 af. At the time the thematic strategies were developed, this conservation program was envisioned to include all measures outlined in Demand Management Program 2 (described in Chapter 7) plus voluntary District-administered programs for graywater systems. Upon development of the hybrid strategies (described in Chapter 9), the graywater programs were dropped due to potential negative environmental and public health concerns.

Operationally, this strategy would rate in the mid range; although it would reduce some of the demand, it would not meet the level of service goal and severe water shortages would occur in some years, as shown in Figure 8-2. The magnitude and frequency of shortages would, however, be less than those experienced under the baseline strategy.

Achieving this aggressive level of conservation presents an implementation risk. Public acceptance of code changes and individual diligence to maintain this level of conservation is not certain. In addition to the risk of not reducing demand by the estimated amount, improperly operated and/or maintained graywater systems may engender some degree of health and safety risk.

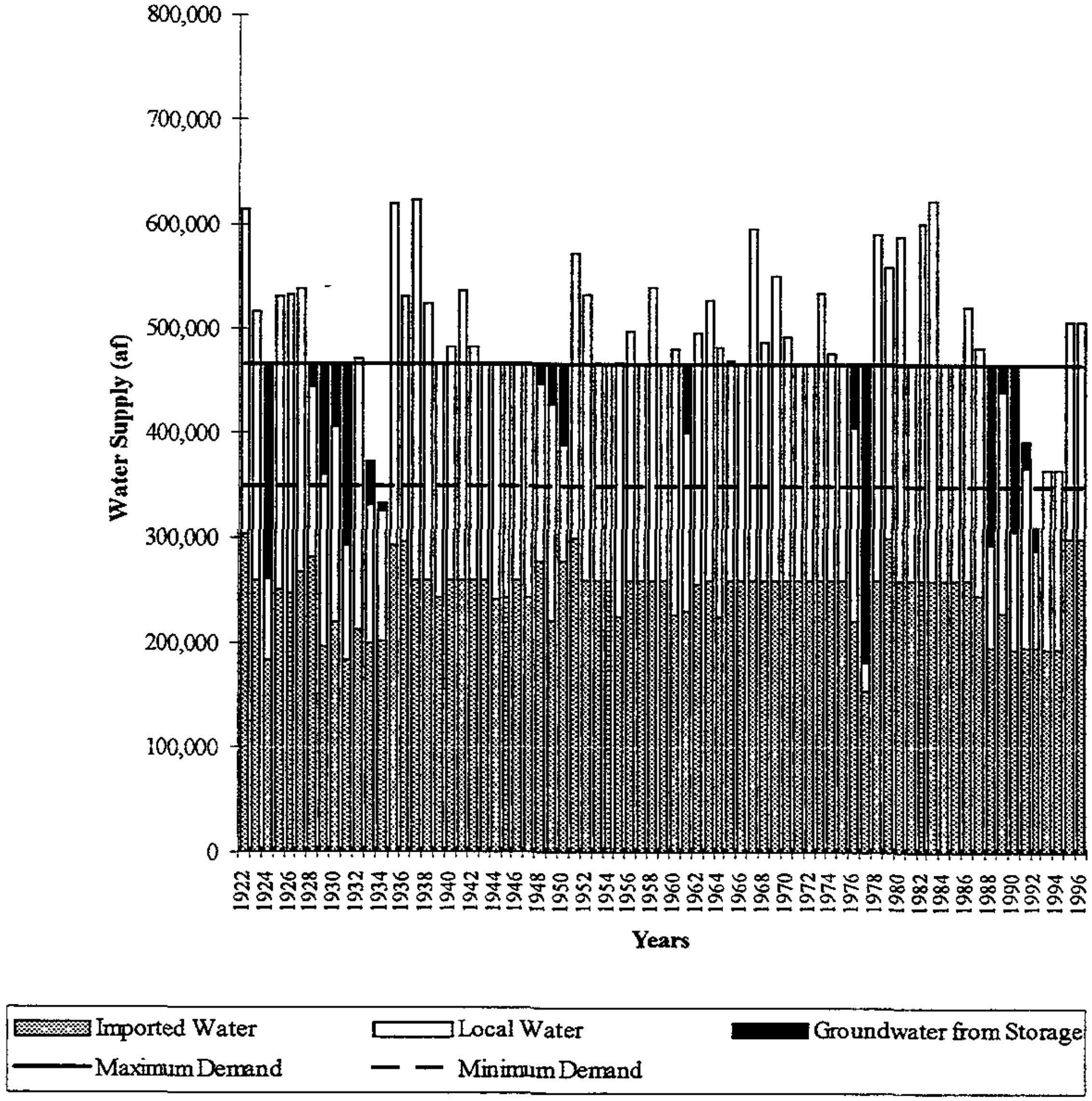
It would be a relatively inexpensive strategy for the District, but because of shortages, sales would be reduced and rates would have to be increased to compensate for lost revenue.

From a community standpoint, aggressive conservation may not be accepted by the public. although it would make the community very water-efficient. During a CDP, there would be less surface water available for recreation and less water would be conveyed to percolation ponds which offer some aesthetic value in addition to their groundwater recharge function.

This strategy could have an effect on the visual environment, and could improve the urban landscape by transitioning plant materials to more native and/or drought-tolerant species. This would, in turn, offer some improvement to natural habitats.

However, during a CDP, less water would be released from reservoirs for groundwater recharge as compared with other strategies.

Figure 8-2
Water Supply Impact of Strategy 2 (Demand Management)
Based on Historic Supply Data



Thematic Strategy 3: Recycled Water

In addition to the core elements, this strategy would use 36,600 af/yr of non-potable recycled water and 60,000 af/yr of potable recycled water (5,000 af/month) for blending in the existing reservoirs. The resulting blended water could either be released for groundwater recharge or delivered to the treatment plants for further processing. Prior to delivery to treatment plants or to recharge facilities, the water must meet stringent water quality guidelines mandated by DHS. Pretreatment is usually necessary to achieve the level of water quality required. One available technology to pretreat the water is RO, which produces a concentrated waste of salts and other contaminants that would require disposal. Implementation of this strategy would meet the estimated shortages of a CDP, as shown in Figure 8-3.

Operationally this would be a good strategy, since it would reduce the demand for potable water by providing non-potable water for landscape and industrial uses. Additional potable water would also be made available through indirect potable recycling processes. Once the various conveyance networks are in place, system flexibility would be greatly enhanced as compared to existing operations and to other strategies. Water demands would be met in all years.

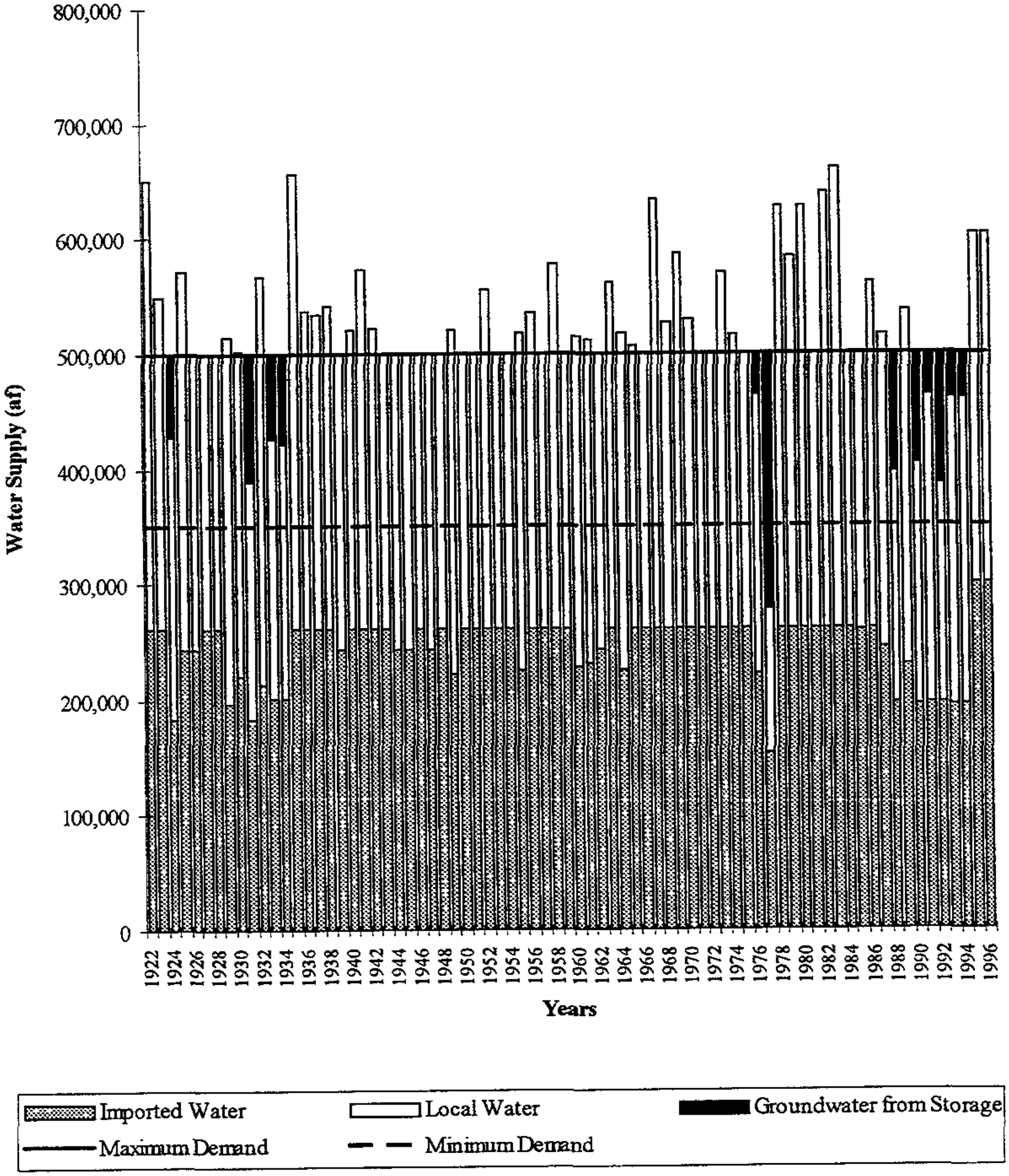
The risk here is the ability to consistently treat recycled water to potable water standards; however, RO technology is not new and has been implemented in San Diego. There is also some risk involved in obtaining public acceptance of indirect reuse for drinking purposes as mentioned under the community objectives ratings.

This would be a very expensive strategy that would get passed on to the customer through higher rates. It is assumed for planning purposes that the District would be responsible for the capital and O&M costs.

Recycled water is a drought-resistant supply, which would be good for business and industry. However, using recycled water as a potable supply may not be acceptable to the public. Conversely, the use of recycled water for non-potable applications has a very high acceptance. This strategy rated medium-plus in terms of recreational opportunities because reservoir levels would remain higher due to the addition of recycled water and the reduced demand on potable supplies. Using recycled water for water supply is a very efficient use of water.

Environmentally, this is the best strategy evaluated. It would keep reservoir levels high. Near-shoreline vegetation of reservoirs and riparian vegetation would receive ample water to maintain growth. The only possible negative aspects of

FIGURE 8-3
Water Supply Impact of Strategy 3 (Recycled Water)
Based on Historic Supply Data



this strategy are the disposal of the concentrated reverse osmosis wastes which would likely require landfilling, and the high energy consumption associated with processing water through reverse osmosis membranes.

Thematic Strategy 4: Maximize Local Storage

In addition to the core elements, this strategy would include a new 25 mgd WTP in South County and expansion of the Rinconada WTP to treat 120 mgd. The objective of this strategy is to maintain local surface and groundwater storage at high levels during normal and wet years. Imported water would be processed through the treatment plants and used during wet and normal years to keep surface storage and groundwater levels high. In a dry year, water stored locally would be used. Though the capacity would be available to treat more water, the plants could not run to capacity without adequate raw water supplies. Water supplies would not be increased above baseline with this strategy, so shortages would still occur during a CDP, as shown in Figure 8-4.

Operationally, this would be a good strategy, although water shortages would occur in drought events when the reservoirs would be lowered to meet the demand. In multi-year drought events, the reservoirs and groundwater basins would not refill to their respective capacities, resulting in more severe water shortages.

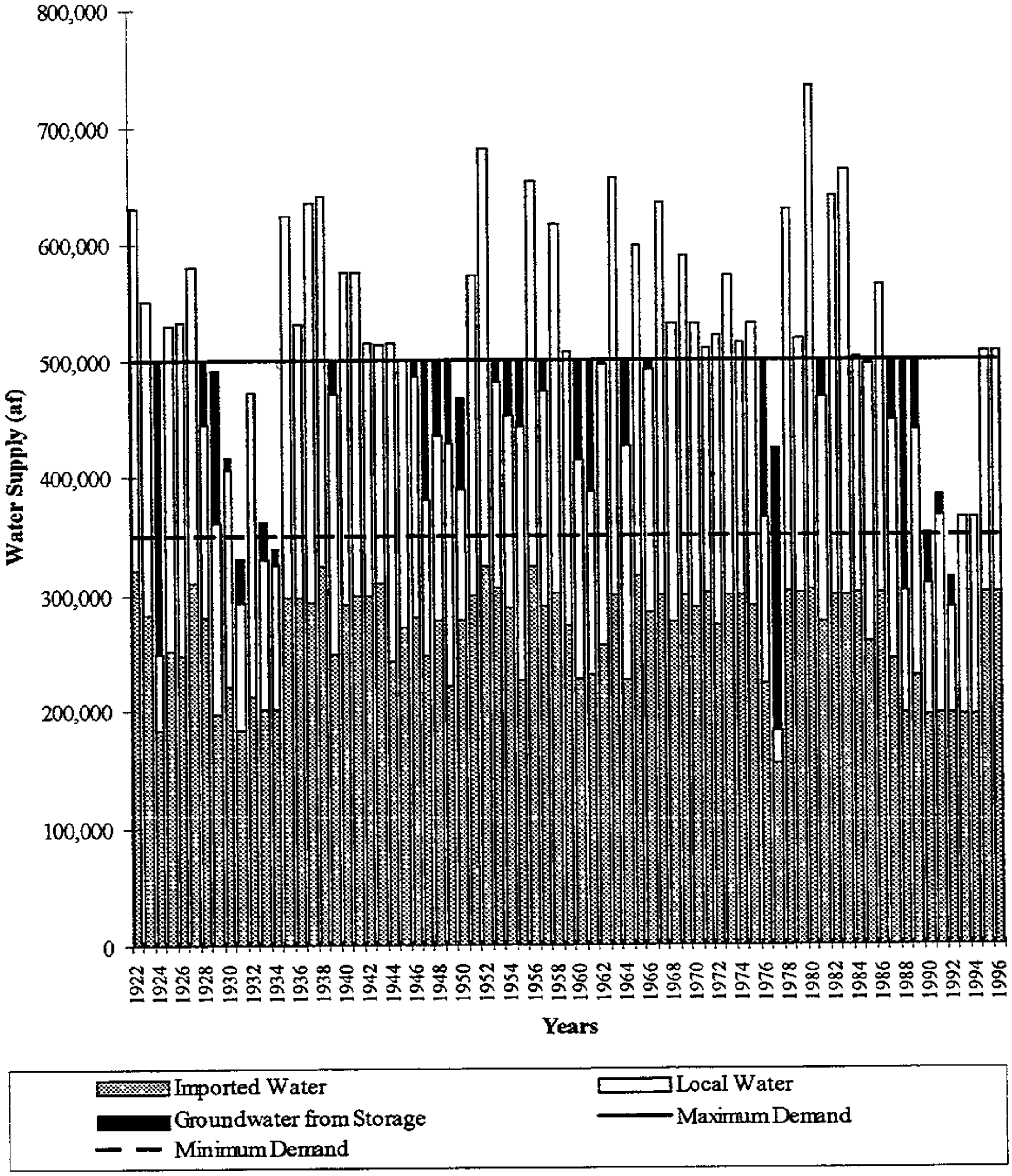
There may be some risks associated with permitting for a new treatment plant, although these would be minor. The larger risk is that retailers may not want to switch to surface water in normal and wet years.

This strategy falls in the mid range of costs as compared to the other strategies.

The community would benefit in normal and wet years because of the new availability of surface water in South County, but in dry years, little improvement would occur there. Water quality, especially in South County, would be improved due to the availability of an alternative supply source. Less of the nitrate-impacted groundwater in this region would be required for drinking water usage. Water recycling and conservation would not be encouraged above baseline conditions. A potentially opposing view of community members is that South County would solely absorb the cost of the treatment plant and distribution system; the groundwater currently used for supply is less expensive than the additional cost of constructing these capital improvements.

Environmentally, this strategy would likely result in minimal impacts. Reservoir levels would be lower than in Strategy 3,

FIGURE 8-4
Water Supply Impact of Strategy 4 (Maximize Local Storage)
Based on Historic Supply Data



but slightly higher than the baseline. The environmental evaluation assumes that recharge activities, if located in stream channels, will be performed so as to minimize impacts to fisheries.

Thematic Strategy 5: New Reservoir

In addition to the core elements, this strategy would include a 550,000 af reservoir, either in or out of the County (actual location unknown). The reservoir would be used to store excess local and imported water supplies that may not be needed in wet years. Once the reservoir is full, future CDPs would be managed through use of the stored water. In the case of multi-year droughts or the occurrence of a drought event prior to reservoir filling, demand shortages would result.

Operationally this would be a good strategy. Figure 8-5 indicates severe shortages in the early years; this is somewhat misleading because the analytical model assumes the occurrence of dry years immediately following reservoir construction before the reservoir has been allowed to fill, which may not be the case. This strategy would provide significant drought-year benefits by providing the ability to store unused entitlement water in wet years which also increases system flexibility. This strategy would still present shortages, but in comparison to Strategy 2, Demand Management, this strategy would be substantially more costly.

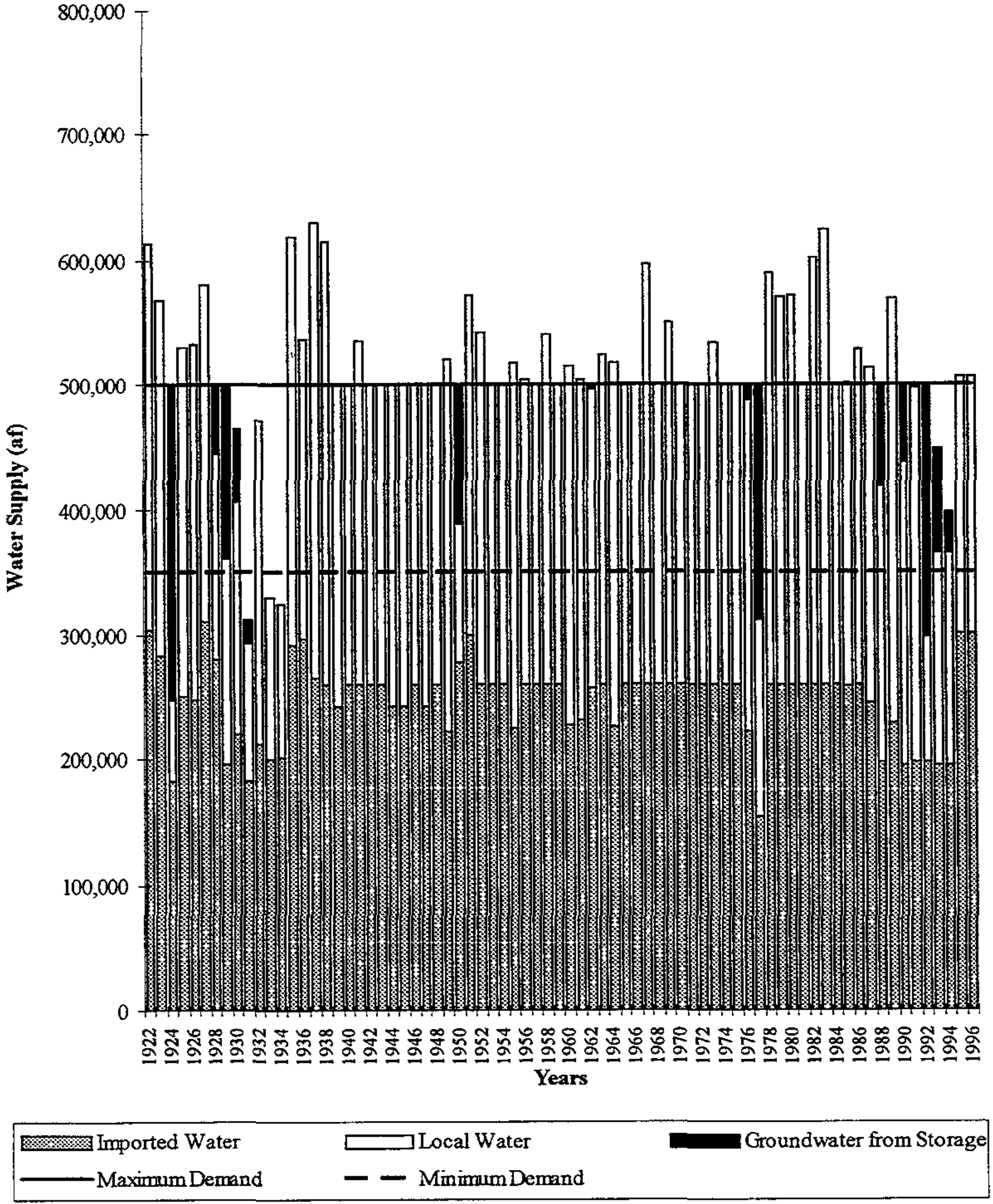
The ability to implement this strategy would have a very high risk. A reservoir in today's regulatory environment is not easily permitted. Water may not be available from this facility in time to meet the growing needs of the County.

This would be a very expensive strategy that would translate to a significant increase in rates.

The community would be affected by the high cost and the minimal water shortages, although new recreational opportunities would be made available at the reservoir. There may exist some community opposition to the construction of a new reservoir, depending on its location and the resources affected. Conservation and recycling efforts would not be encouraged above the baseline conditions.

Environmentally, this strategy would have the greatest negative impacts of all the strategies evaluated. The possible inundation of existing vegetation, wildlife, and archeological sites would require significant amounts of mitigation, if the reservoir would even be permitted at all. Impacts to fisheries could also occur. Dams can alter the geomorphological characteristics of the channel which may result in channel erosion at the downstream side of the dam.

FIGURE 8-5
Water Supply Impact of Strategy 5 (New Reservoir)
Based on Historic Supply Data



Thematic Strategy 6: Water Banking

In addition to the core elements, this strategy would rely on an out-of-County groundwater bank to store imported water in normal and wet years. In dry years, an entitlement exchange would occur, and the District would obtain water through the existing imported water delivery system. Although the demand shortfall chart indicates shortages, particularly in the early years, this is due to modeling assumptions similar to those described in Strategy 5, New Surface Reservoir. Multiple banking agreements are assumed.

Operationally, this strategy rates in the mid range for all objectives. No new piping or construction would be required for this strategy. As shown in Figure 8-6, shortages would be similar to those experienced in Strategy 5.

There is some risk involved in any banking arrangement, particularly the risk of adjudication of the ground water basin; however, it is expected that the District's contractual rights to the banked water would be protected and the water would remain available. In fact, the adjudication process may solidify the District's contractual rights in relationship to groundwater rights of other involved parties.

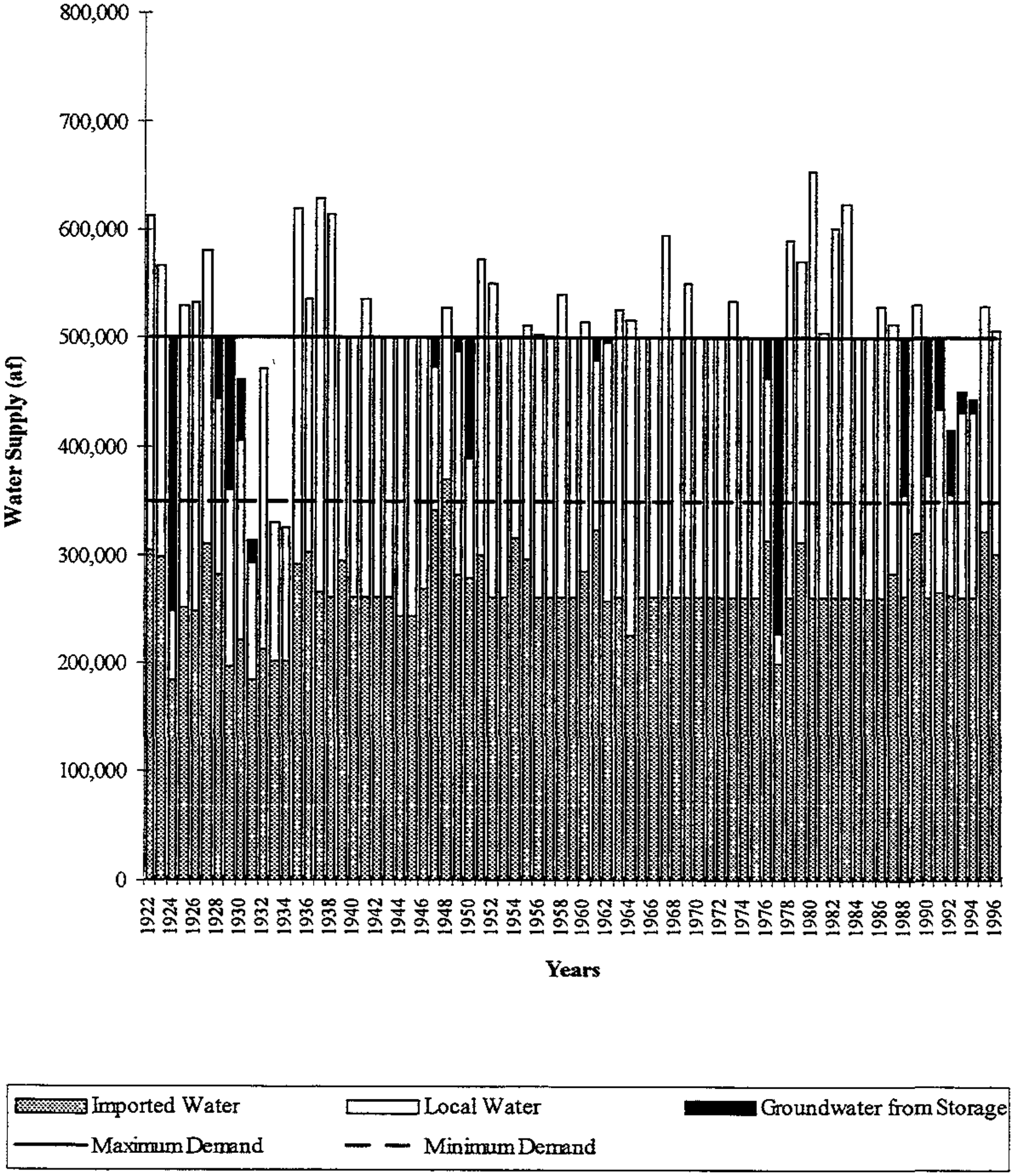
Water banking is a technically proven technology, but institutionally untested at this level. Groundwater storage is more easily permitted in today's regulatory environment than a surface reservoir.

This is a relatively low-cost alternative (as demonstrated by the Board's recent short-term contract with Semitropic Water District). The associated rate impacts would not be significant.

Community ratings fall in the mid range for all objectives, except for public acceptance, which rates a little higher. There will be fewer shortages than with some of the other strategies. This strategy is rated somewhat higher than new surface storage because of a non-structural approach to obtaining additional storage capacity. The in-County groundwater basin would not be overdrafted to the extent presented in other strategies because of the magnitude of water banked that would become available in a CDP.

There do not appear to be any significant environmental issues with implementation of this strategy. Infrastructure issues associated with the bank are assumed to be dealt with by the banking entity. Entitlement exchange in drier years do not appear to represent any additional Delta issues, either. While it is likely that environmental impacts will manifest at the

FIGURE 8-6
Water Supply Impact of Strategy 6 (Water Banking)
Based on Historic Supply Data



water banking site, it is assumed they will be minimal. Even minimal impacts however, whether in or out of the County bounds, may require mitigation efforts under CEQA or for permit acquisition.

Thematic Strategy 7: Long-Term Transfers

In addition to the core elements, the District would secure access to an additional 100,000 af of imported water. This water would be available to the District every year or be available in dry years through a dry-year option program.

Operationally this is a good strategy. As shown in Figure 8-7, there would be no water shortage, and water that is purchased but not needed could be sold on the open market. Assuming that agreements are secured, this strategy offers a higher degree of flexibility as compared with Strategy 6, Water Banking, because the 100,000 af would theoretically be available every year or whenever it is needed.

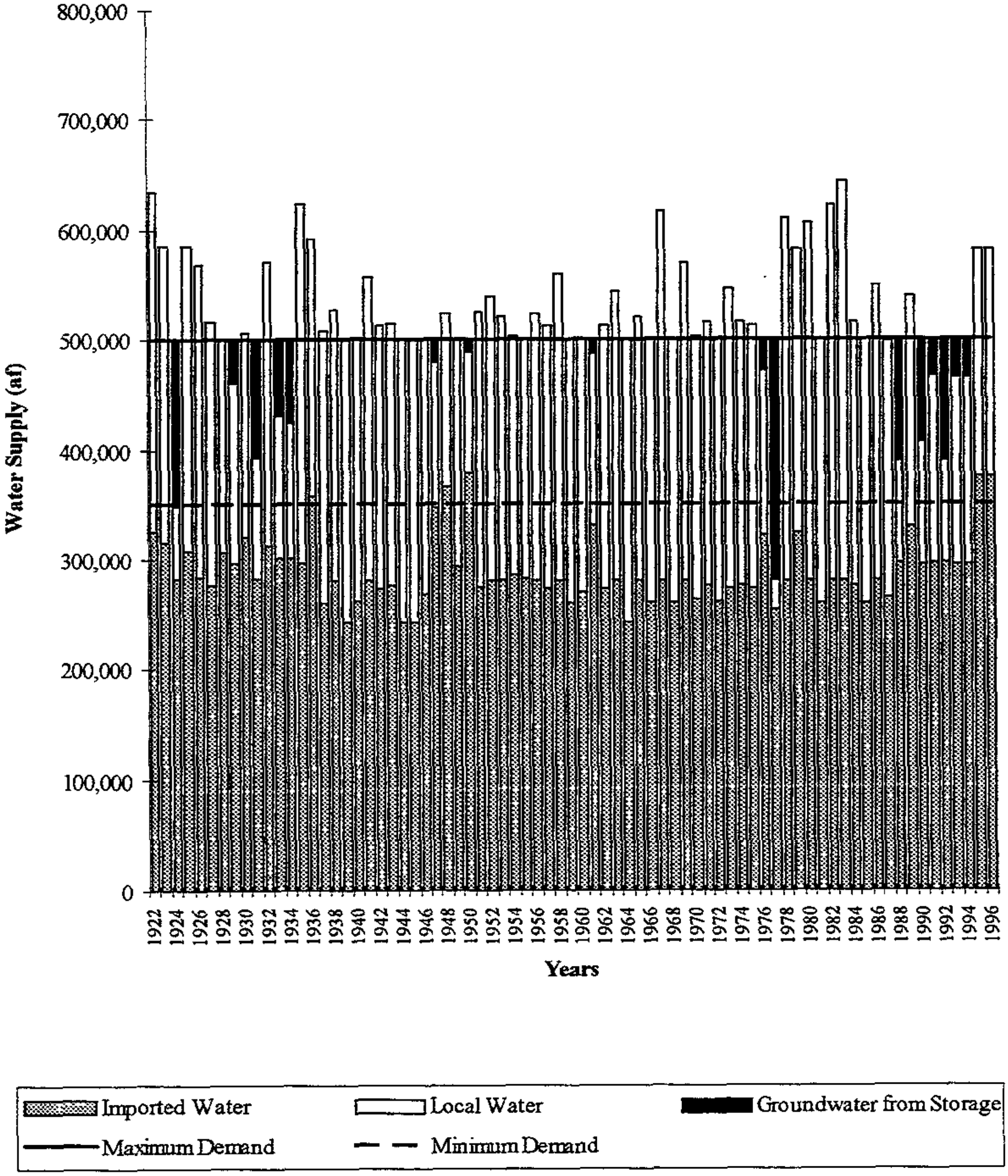
There is risk associated with the challenge of finding sellers who would agree to selling this quantity of water in dry years. However, transfers are becoming institutionally and politically easier, and in some arenas, encouraged. As compared to Strategy 6, this strategy is less risky because groundwater basin adjudication is not a threat, and long-term transfers have been successfully executed in the past.

Costs and rate impacts fall in the mid range, but are slightly more expensive than some of the other strategies because long-term transfer costs are relatively high.

The community ratings also fall in the mid range. Transfers would be more acceptable than banking since there are no shortages with transfers, but an increased reliance on imported water may not be agreeable to the community. Recreational opportunities would be good because reservoir and stream levels would remain high. Conservation and recycling would not be encouraged beyond baseline.

This strategy does not present negative environmental impacts since it fully meets the demands, and more water should be available for beneficial uses. However, there may be environmental or third-party impacts due to land fallowing or conversion of agricultural land in those regions from which the transfer water is obtained.

FIGURE 8-7
Water Supply Impact of Strategy 7 (Long-Term Transfers)
Based on Historic Supply Data



Thematic Strategy 8: Short-Term (As-Needed) Transfers

In addition to the core elements, this strategy would rely on dry-year purchases of transfer water from the State Drought Water Bank or other willing sellers in the amount of 32,000 af per year. If precipitation in any one year is equal to or less than 8 inches, water would be purchased in the second year. If precipitation is equal to or less than 12 inches for two consecutive years, water would be purchased in the third year. It has also been assumed that a minimal level of rationing, approximately 15 percent, would be asked of the customer, since this has historically been a prerequisite for purchasing water from the State Drought Water Bank.

As shown in Figure 8-8, this strategy is not as beneficial as long-term transfers, but does offer benefits to the system. It may not be perceived as providing the desired level of service since everybody would be asked to participate in a minimal rationing program in drier years. Retailers base rationing on a household's previous year's usage so some customers who are already more water-efficient than others may not be able to further reduce their usage.

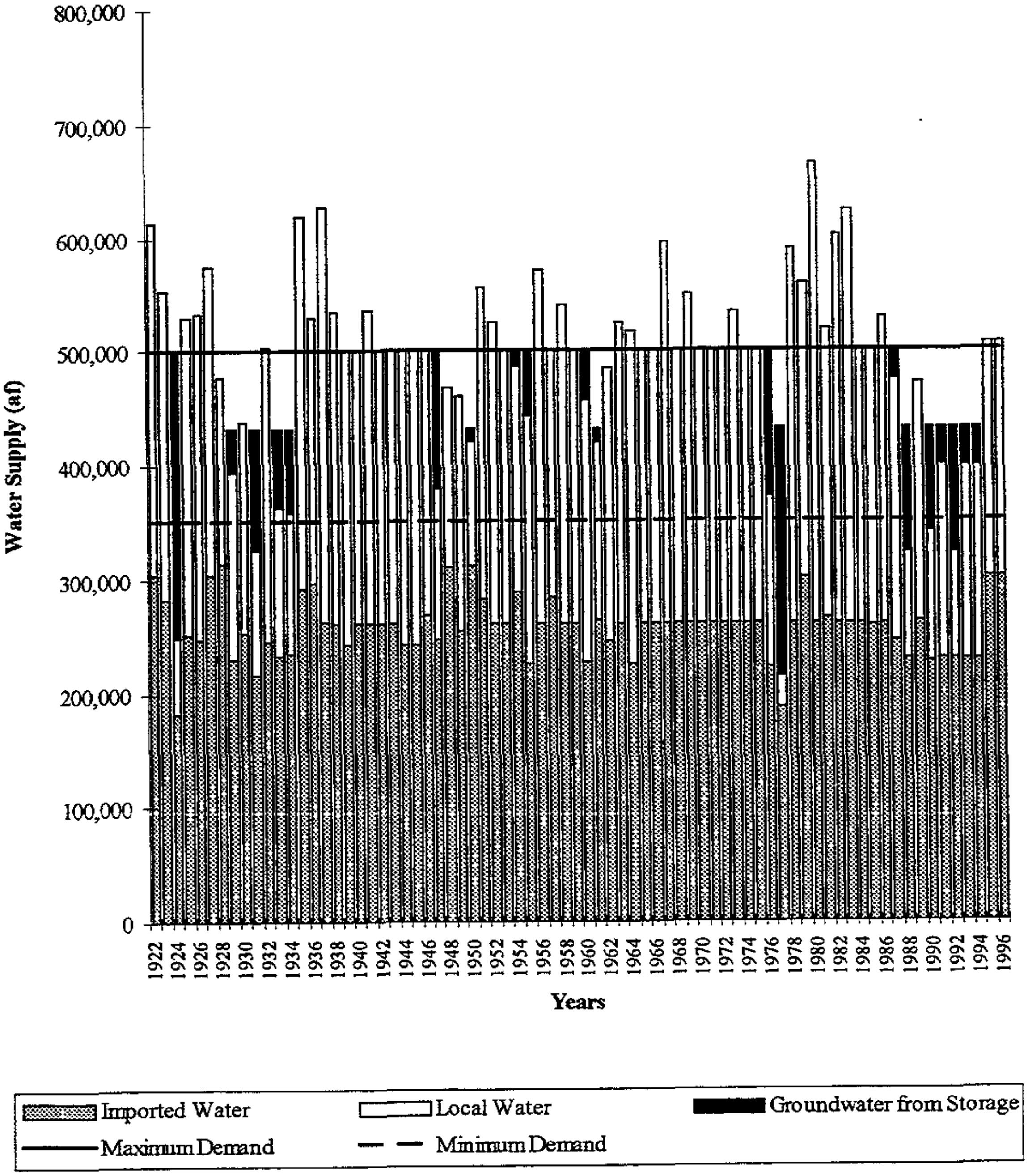
This strategy has minimal risk since it has been accomplished in the past. Historically, even in dry years, there are always willing sellers, for a price. This strategy is considered to be less risky than long-term transfers because less quantity would be purchased each year and only in those years in which it was required. Some administrative risk is present in that the State Bank could change its operation or cease altogether.

Costs are relatively low. This strategy requires minimal capital costs, and only dry year purchases. Rates would only be minimally affected.

Community ratings all fall in the mid range. Some rationing is included but should be acceptable at this low level. Recreational uses would be somewhat improved over baseline. Use of this "as-needed" strategy could be interpreted by the community as poor long-term planning on the part of the District.

Strategy 8 is environmentally benign, but may have some impacts associated with dry year rationing, which would be primarily aesthetic. Since water would be imported to the County, it is assumed that there would be more water available for beneficial uses as compared with some of the other strategies. As with Strategy 2, Demand Management, urban landscapes may be improved by transitioning to native and/or drought-tolerant species due to the rationing component.

FIGURE 8-8
Water Supply Impact of Strategy 8 (Short-Term Transfers) Based on Historic Supply Data



Chapter 9
HYBRID WATER RESOURCE STRATEGIES

This chapter describes four "hybrid" water supply strategies developed by District staff. These hybrid strategies differ in concept from the thematic strategies described in Chapter 8: while the thematic strategies each focused on a single component, the hybrid strategies each combine multiple components to meet a single water supply objective.

The chapter describes how District staff developed and evaluated the hybrid strategies. It provides cost estimates for the strategies and their components, and explains the assumptions behind these estimates. The chapter concludes with detailed descriptions of the strategies and how each was rated according to the IWRP planning objectives.

Hybrid Strategy Development

District staff developed the hybrid strategies based on the suggestions of Level 1 external stakeholders (see sidebar) and the internal stakeholders at the District. Each of the hybrid strategies is designed to meet the County's total supplemental water needs of 100,000 af during a CDP for the planning horizon of 2020. The hybrid strategies are:

1. Minimize Environmental Impacts
2. Maximize Flexibility to Meet Changing Demands
3. Maximize Local Reliability
4. Minimize Costs

In addition to its main objective, each hybrid strategy attempts to incorporate reliable water service, water reuse, conservation, and environmental considerations. These hybrid strategies are by no means exhaustive: they can be combined to achieve more than one objective, and additional hybrid strategies can be developed and studied further.

At their July 11 meeting, the Level 1 stakeholders were divided into break-out groups. Each group formulated a hybrid strategy:

Group 1:	*Long-Term Transfers/Banking* *(40-55,000 af)* *Demand Management* *(20-25,000 af)* *Non-Potable Recycling* *(25-35,000 af)* *Short-Term Transfers* *(as needed)*
Group 2:	*Maximize Existing Local Storage* *(20-30,000 af)* *Demand Management* *(5-30,000 af)* *Recycling/Reuse* *(40-65,000 af)* *Transfers/Banking* *(as needed)*
Group 3:	*Water Recycling* *Water Banking* *Demand Management* *Transfers* *(no af figures supplied)*

The common elements among the three groups were demand management, recycling, transfers, and water banking. District staff employed these elements to form the hybrid strategies.

The Strategy Evaluation Process

District staff rated the four hybrid strategies in much the same way as it did the thematic strategies: using high, medium, and low scores modified by pluses and minuses. However, rather than rating the hybrid strategies in terms of all the IWRP planning objectives, the project team found that the following six objectives were the most useful for differentiating among the hybrid strategies:

- Maximize Effective Use
- Maximize Ability to Respond to Changing Conditions
- Minimize Rate Impacts
- Maximize Public Acceptance
- Maximize Quality and Treatability of Source Water
- Avoid or Minimize Adverse Impacts to Habitat or Ecosystems

Evaluations of each hybrid strategy are described in general terms in this chapter and summarized at the end of the chapter in Figure 9-5. A detailed record of the evaluation and ratings appears in Appendix G; the economic analysis used as a basis for the evaluation is described in Appendix H. The modeling assumptions used to evaluate water supply impacts of the hybrid strategies are explained in Appendix K.

It is important to note that the hybrid strategies were rated relative to one another. For example, a low rating in the operational category may not mean that implementation of the hybrid strategy would result in severely compromised operations, but that at least one of the other three hybrid strategies is considered to present fewer hurdles from an operational standpoint.

Cost Analysis and Assumptions

Cost calculations for the hybrid strategies are based on the best estimated initial capital investment and annual capital and operating costs for the components of each hybrid strategy. Table 9-1 shows the costs for each hybrid strategy and its components.

Capital costs incorporate a 20 percent general contingency and an additional 25 percent for engineering, administration, and legal services. Capital costs are assumed to be paid over 30 years at an interest rate of 7 percent. The annual operating or variable costs cover all operations and maintenance expenses, such as labor, material, and energy costs. For some components, such as option costs for dry period transfers, the varying operating costs are averaged over a 75-year period of historical hydrology.

TABLE 9-1

Cumulative Capital and Operating Costs of Hybrid Strategies by Component[1] (millions of 1996 dollars)

	1 Minimize Environmental Impacts	2 Maximize Flexibility	3 Maximize Local Reliability	4 Minimize Costs
Demand Management 1	—	14	14	—
Demand Management 2	20	—	—	20
Banking	133	133	—	—
Long-Term Transfers	—	125	—	140
Non-Potable Recycling	918	—	91	—
Indirect Potable Recycling	—	—	552	—
Reservoir	—	—	315	—
District Total	1,071	272	972	160
Community[2]	82	45	45	82
Total Strategy	1,153	317	1,017	242

[1] Total value of outlays to 2020.

[2] Community costs arise from conservation expenditures by end users.

Strategy Descriptions and Ratings

Hybrid Strategy 1: Minimize Environmental Impacts

At the May 9 Level 1 stakeholders meeting, the suggestion was made that when evaluating the costs of various hybrid strategies the District consider total cost, including such costs as environmental mitigation. Thus, cost data for the hybrid strategies and their components include the initial capital outlay, financing costs, and annual operating costs.

Level 1 stakeholders also suggested that the District consider total costs borne by the ultimate user (both water and sewer costs) rather than focusing only on the costs borne by the District. Such community costs were considered under the objective "Protect the Economic Well-Being of the County by Minimizing Costs to the Community."

This hybrid strategy employs components thought to have the least impact on the environment: demand management, non-potable recycling, and water banking. The demand management program would be phased in over time as regulations are changed. Non-potable recycling would be phased in as projects warrant their construction and as opportunities arise. Water banking arrangements are expected from more than one source and could also be phased in as the need for the water becomes more certain. These components are described in detail below; component staging is presented in Figure 9-1. The total cost of this hybrid strategy between 1997 and 2020 is estimated at $1,153 million.

- **Demand Management**. This hybrid strategy uses Program 2, which is expected to reduce water demand by 25,200 af/year. Program 2 includes Program 1, which would enhance residential landscape incentives and commercial and industrial incentives, add more commercial and industrial audits, encourage the use of low-flow dishwasher retrofits, and require water-efficient landscapes for new construction. In addition, Program 2 would lower demands through regulatory measures: point-of-use water heaters would be required in new residential construction, and developer demand offset regulations would require developers to replace old and inefficient fixtures or to fund other programs to secure water for serving new developments. There are no capital costs associated with Program 2; the estimated cost to operate the program averages $5.6 million per year; 80 percent of the cost is borne by the end user.

The cost to the City of San Jose should the RWQCB require additional actions to reduce wastewater discharges are difficult to quantify at this time. The District will consider this issue in discussions with the City regarding a joint venture to promote additional recycling.

- **Non-Potable Recycling**. This hybrid strategy assumes implementation of 32,300 af of non-potable recycled water over the baseline of 14,400 af. It would expand the South Bay Recycling Program to close to its ultimate market. A greenbelt survey completed by the District in 1990 determined that a market for more than 32,300 af exists within the landscape industry. The majority of landscape need is within the San Jose/Santa Clara service area and could account for 28,000 af of this market. The capital investment for this component is estimated at $400 million, with an annual capital cost of $32 million and an annual operating cost of $11 million.

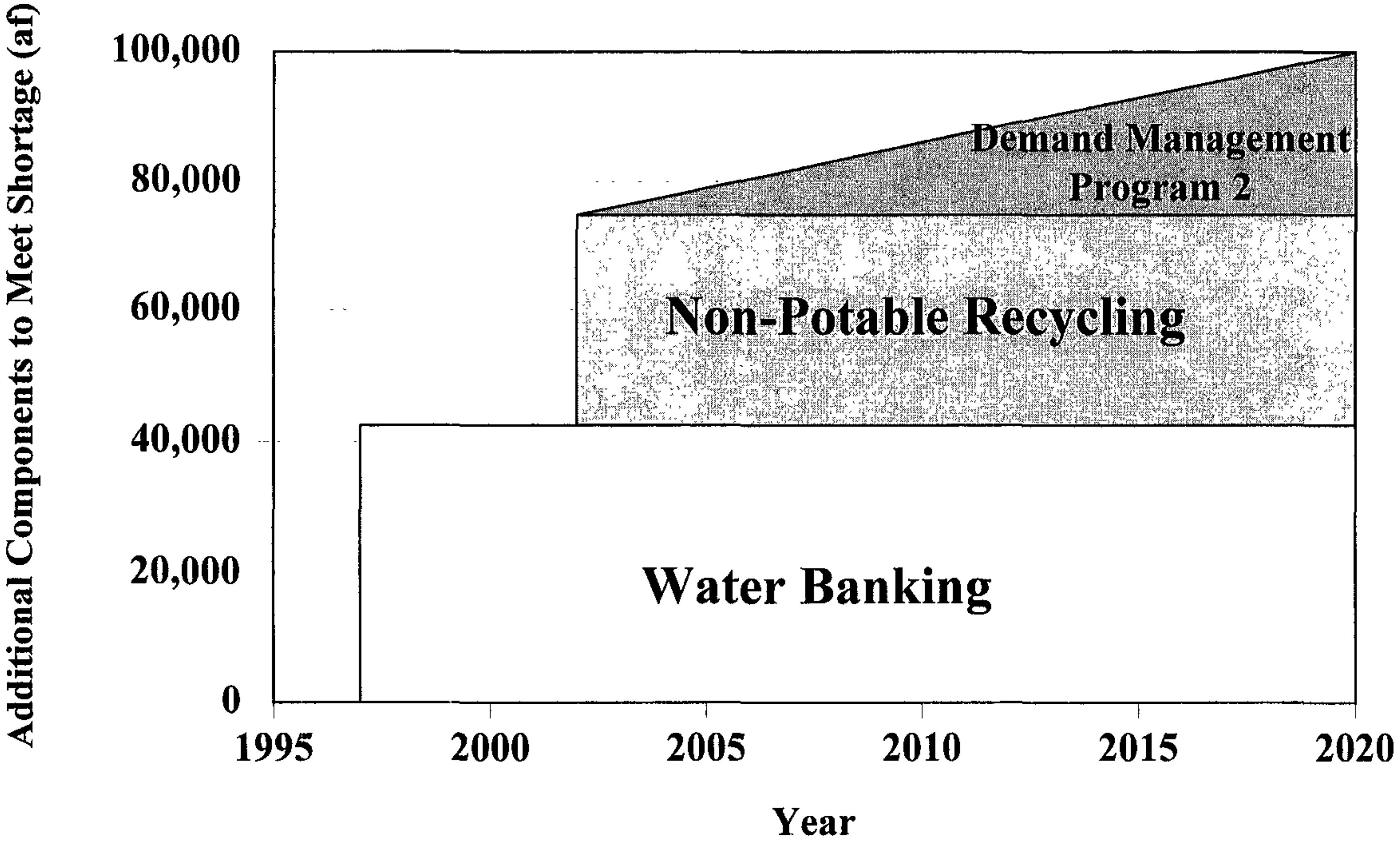
- **Water Banking**. The basic concept of a water banking program is that one party transfers water to another during normal and wet years (the "put"), and the water or a portion of it is transferred back during dry years (the "take"). Banking programs commonly involve either actual groundwater recharge of the banked water, or "in lieu" recharge through direct use of the surface water in place of groundwater pumping. During return years, groundwater is used in place of surface water that is transferred back to the banking entity, and/or some crop conversion or fallowing may occur. A loss of 10 percent of the put is part of the contract to account for the other agency's system losses. The put and take levels change with the hydrology that occurs and the amount of storage that has been contracted. Operational studies show the optimal additional storage capacity that is beneficial to the District's system is 350,000 af; further studies are needed to refine this value. During periods when allocations are 100 percent the maximum take is 78,000 af but during dry periods the take is only 47,600 af. During periods of full allocations the put is only 54,900 af. The capital investment for this component is estimated at $47 million, with an annual capital cost of $3.8 million and an annual operating cost of $2 million.

Hybrid strategy 1 rated high-minus for effective use of water supplies because of the banking component that allows water to be saved during wet years. It rated medium-minus, the lowest of all the hybrid strategies, for its ability to respond to changing conditions; this is due to mandated demand management programs and the large quantity of non-potable recycled water. This was the second costliest hybrid strategy, rating medium-minus for rate impacts. For public acceptance this strategy rated medium because of mandatory demand management. It rated medium-minus for water quality because of the large use of non-potable recycled water and potential cross connection problems. This strategy earned a high, the highest rating of all in the environmental category, for minimizing impacts to habitat, thanks to the limited impacts of non-potable recycling and the demand management program.

Hybrid Strategy 2: Maximize Flexibility to Meet Changing Demands

This hybrid strategy strives to maximize the District's flexibility to meet actual water demands, whether greater or less than anticipated. The components used in this strategy are demand management, long-term transfers, and water banking. The demand management program would be phased in over time. Long-term transfers are expected from more than one

FIGURE 9-1
Hybrid Strategy 1: Minimize Environmental Impacts
Staging of Components Through 2020

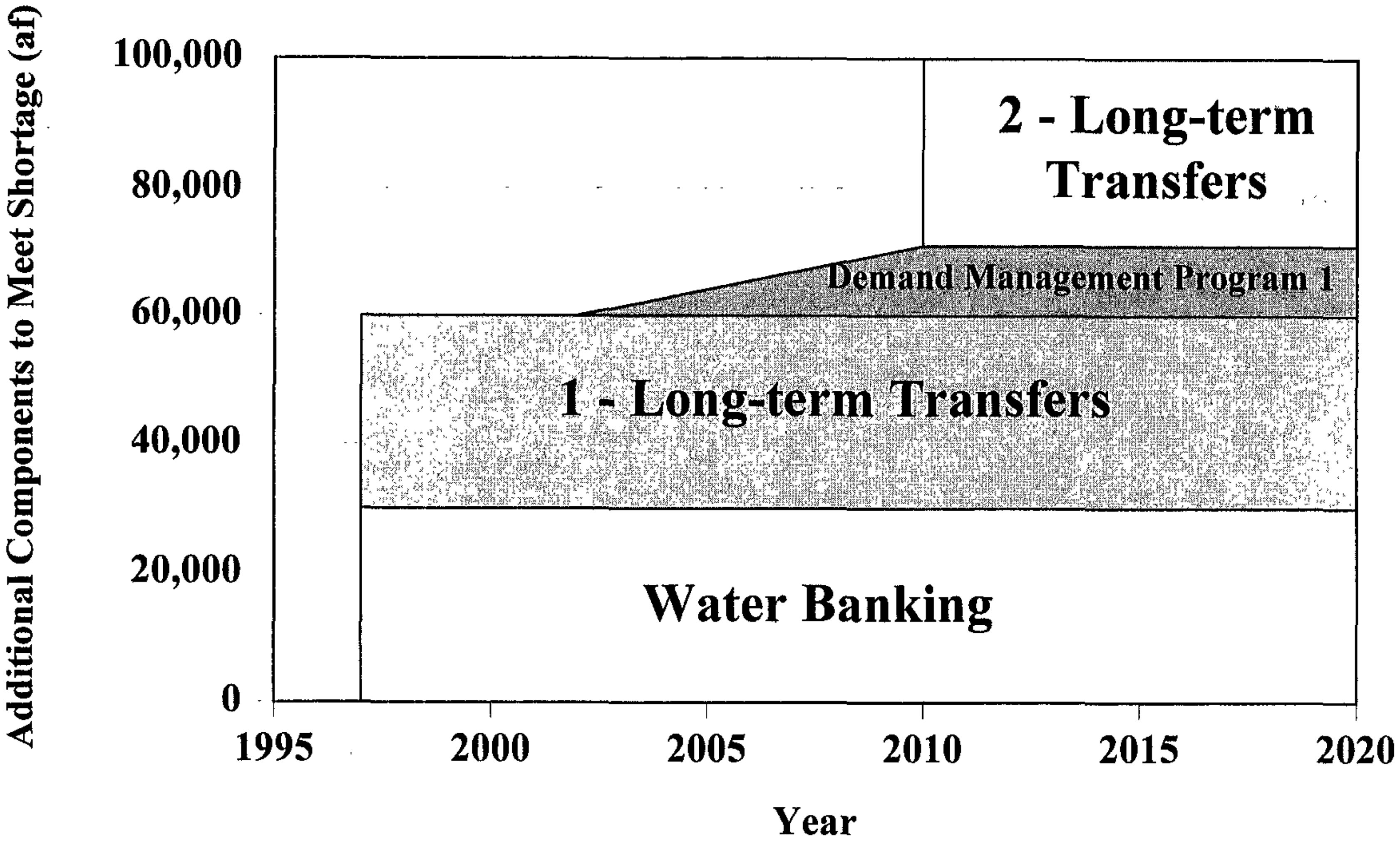


source and could also be phased in as the need for the water becomes more certain. Water banking could occur at more than one location or could be contracted for in pieces at one site as the need arises. (Transfers and banking have a limited term in their contract where renewal is optional and hence provide an opportunity to not renew if expected water demands do not materialize.) These components are described in detail below; component staging is presented in Figure 9-2. The total cost of this hybrid strategy between 1997 and 2020 is estimated at $317 million.

- **Demand Management**. This hybrid strategy uses Program 1, expected to reduce demand by 11,000 af/year. This program would enhance the residential landscape and commercial and industrial incentives, add more commercial and industrial audits to the program, encourage the use of low-flow dishwasher retrofits, and require water-efficient landscapes for new construction. There are no capital costs associated with Program 1; the cost to operate the program averages $3.3 million per year.
- **Long-Term Transfers**. The District would contract with another party to buy imported water during dry periods. The contract would have an expiration date and renewals would have to be negotiated in the future. The District would pay every year to retain the option to buy the water, and would pay an additional amount upon delivery of the water. The estimated cost of an option is $50 per af, plus an additional $300 per af when the option is exercised. During the 75 years of historical hydrology used in the District's analysis, the option is only exercised in 20 years and requires 60,000 af when taken. But the $50 per af option price is paid during 55 of the 75 years. No capital costs are anticipated for this component, but an annual operating cost of $7 million is estimated.
- **Water Banking**. This hybrid strategy uses a water banking component which is identical to that described in Hybrid Strategy 1. It has a capital investment of $47 million, with an annual capital cost of $3.8 million and an annual operating cost of $2 million.

Hybrid strategy 2 rated high for effective use of water supplies, due to the banking component that allows water to be saved during wet years, and the dry period transfers that only occur when water is needed. These same components earned it a medium-plus for its ability to respond to changing conditions. This was also the second least costly strategy, rating medium-plus for rate impacts. For public acceptance this strategy was the best and rated medium-plus because of voluntary demand management. It rated high-minus for water quality because this hybrid strategy does not substantially

FIGURE 9-2
Hybrid Strategy 2: Maximize Flexibility to Meet Changing Demands
Staging of Components Through 2020



change the current operations. This hybrid strategy earned the second-highest rating, a medium-plus, for its ability to minimize the impacts to habitat; this rating is based on tradeoffs between the banking component, which is more environmentally benign than other components, and water transfers, which could result in environmental impacts in the area where the water originates.

Hybrid Strategy 3: Maximize Local Reliability

This hybrid strategy maximizes the local reliability of water supplies by developing more local water and by storing it in either a local reservoir built by the District or at an out-of-County location with the District as one of the participants. The components used in this hybrid strategy are demand management, non-potable reuse, indirect potable reuse, and a new reservoir. Because these last two components have long lead times, interim components may have to be developed before either of these two components could be implemented. These components are described in detail below; component staging is presented in Figure 9-3. The total cost of this hybrid strategy between 1997 and 2020 is estimated at $1,017 million.

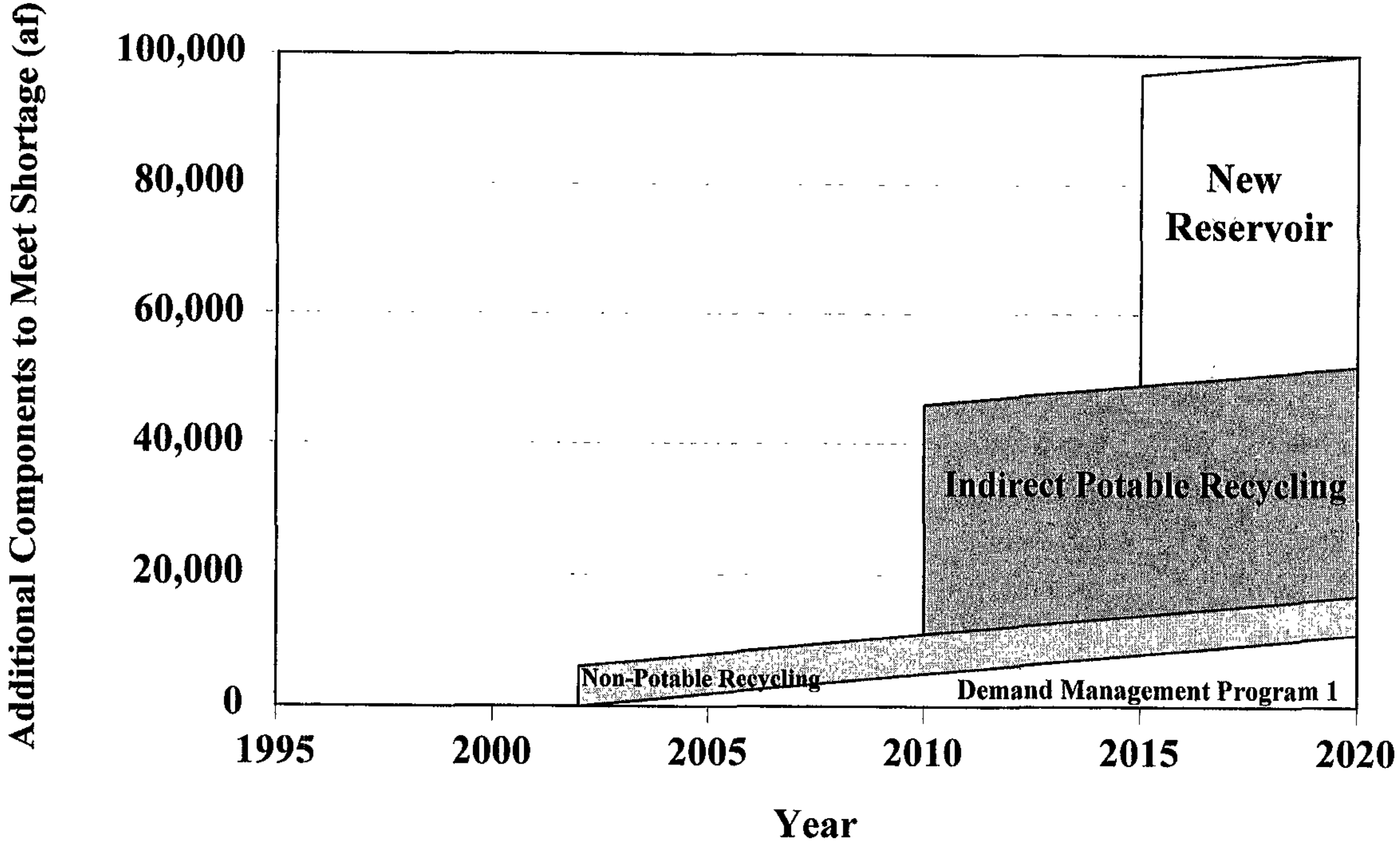
Strategy 3, Maximize Local Reliability, allowed the project team to respond to the request of some Level 1 stakeholders to explore a strategy that maximizes local control over water supplies and reduces flows to the Bay. This strategy has a higher price tag than the other hybrid strategies because of the initial capital investment required for a reservoir or water recycling facility. The issue here is how much reliability should the community seek, and at what price?

- **Demand Management**. This hybrid strategy uses demand management Program 1, which is identical to that described in hybrid strategy 2. It has no capital costs and estimated annual operating costs average $3.3 million.

- **Non-Potable Recycling**. This hybrid strategy takes a less expansive approach to non-potable recycling than does hybrid strategy 1. It relies on only the non-potable recycling that would be the infill for the existing South Bay Recycling program (2,000 af) and the extension of the Gilroy/Morgan Hill program into Morgan Hill (4,000 af); this amounts to 6,000 af. The capital investment for this component is estimated at $30 million with an annual capital cost of $2 million and an annual operations and maintenance cost of $2.4 million.

- **Indirect Potable Recycling.** Storing and blending recycled water in Anderson reservoir for groundwater recharge or high-level treatment at the District's WTPs complements the District's system and would not compete with limited recharge facilities. Use of this component is assumed only when the need for water exists to lower the variable costs: that is, during wetter periods when water is plentiful this facility would not be operated. For this hybrid strategy, 35,000 af of indirect potable reuse is assumed. The capital investment for this component is estimated at $265 million with an annual capital cost of $21 million and an annual operating cost of $23 million.

FIGURE 9-3
Hybrid Strategy 3: Maximize Local Reliability
Staging of Components Through 2020



- **New Reservoir**. Additional surface storage can be constructed in a joint venture with other agencies using a site out of the County or by a single or joint venture by the District with a site in the County. The out-of-County facility could be something like the LBG reservoir proposed by the Department of Water Resources. LBG would store water south of the Delta during periods of high winter flows for later release which would reduce summer demands for Delta exports. By reducing exports during late spring and summer, more water remains in the Delta system to maintain water quality standards and reduce the impacts to the Bay-Delta ecosystem. Previous operational studies show the optimal additional storage capacity that is beneficial to the District's system is 350,000 af; further studies are needed to refine this value. The capital investment for this component is estimated at $360 million with an annual capital cost of $29 million and an annual operating cost of $5 million.

Hybrid strategy 3 rated high for effective use of water supplies because of the additional surface storage component that allows water to be saved during wet years and the dry period transfers that only occur when water is needed. It rated high-minus for its ability to respond to changing conditions, due to its diverse range of components. This was the costliest hybrid strategy, rating a low for rate impacts. For public acceptance this hybrid strategy rated low because of the inclusion of indirect potable recycling and the new reservoir. It rated low-minus for water quality because of the potential risk associated with indirect potable recycling, even though this hybrid strategy stores water during high flows (when quality is good) for releases in dry periods. This hybrid strategy was the lowest ranked, a low-plus, for its ability to minimize impacts to habitat; this rating is based on the inclusion of a new reservoir.

Some Level 1 external stakeholders challenged the ratings District staff gave to the indirect potable recycling component of Strategy 3 as too low. The District will monitor developments in this technology that would lower costs and improve the likelihood of public acceptance, and will explore the possibility of finding a partner for cost-sharing. This component will be reevaluated as circumstances change.

Hybrid Strategy 4: Minimize Costs

This hybrid strategy uses two components to minimize costs to the community: demand management and long-term transfers. Water banking, another low-cost component, was also analyzed but was found to be slightly higher in cost. The demand management program would be phased in over time as regulations are changed. Long-term transfers are expected from more than one source and could also be phased in as the need for the water becomes more certain. These components are described in detail below; component staging is presented in Figure 9-4. The total cost of this hybrid strategy between 1997 and 2020 is estimated at $242 million.

- **Demand Management.** This hybrid strategy uses Program 2, which is identical to that described in hybrid strategy 1. It has no capital costs and estimated annual operating costs of $5.6 million.
- **Long-Term Transfers.** This hybrid strategy uses a long-term transfers component which is similar to that described in hybrid strategy 2, but uses 75,000 af instead of 60,000 af. It requires no capital investment or annual capital cost; the annual operating cost is $9 million.

Hybrid strategy 4 rated medium-plus for effective use of water supplies because the dry period transfers only occur when water is needed. It rated medium for its ability to respond to changing conditions. This hybrid strategy was the least costly, rating medium-plus for rate impacts. For public acceptance this hybrid strategy was ranked medium-minus because of mandatory demand management and the high risks for the large quantity of water transfers needed. It rated high-minus for water quality because this hybrid strategy does not substantially change the District's current operations. This hybrid strategy rated medium for its ability to minimize habitat impacts, due to potential third-party impacts from water transfers.

The evaluation for all four hybrid strategies is portrayed in chart form in Figure 9-5.

FIGURE 9-4
Hybrid Strategy 4: Minimize District Costs
Staging of Components Through 2020

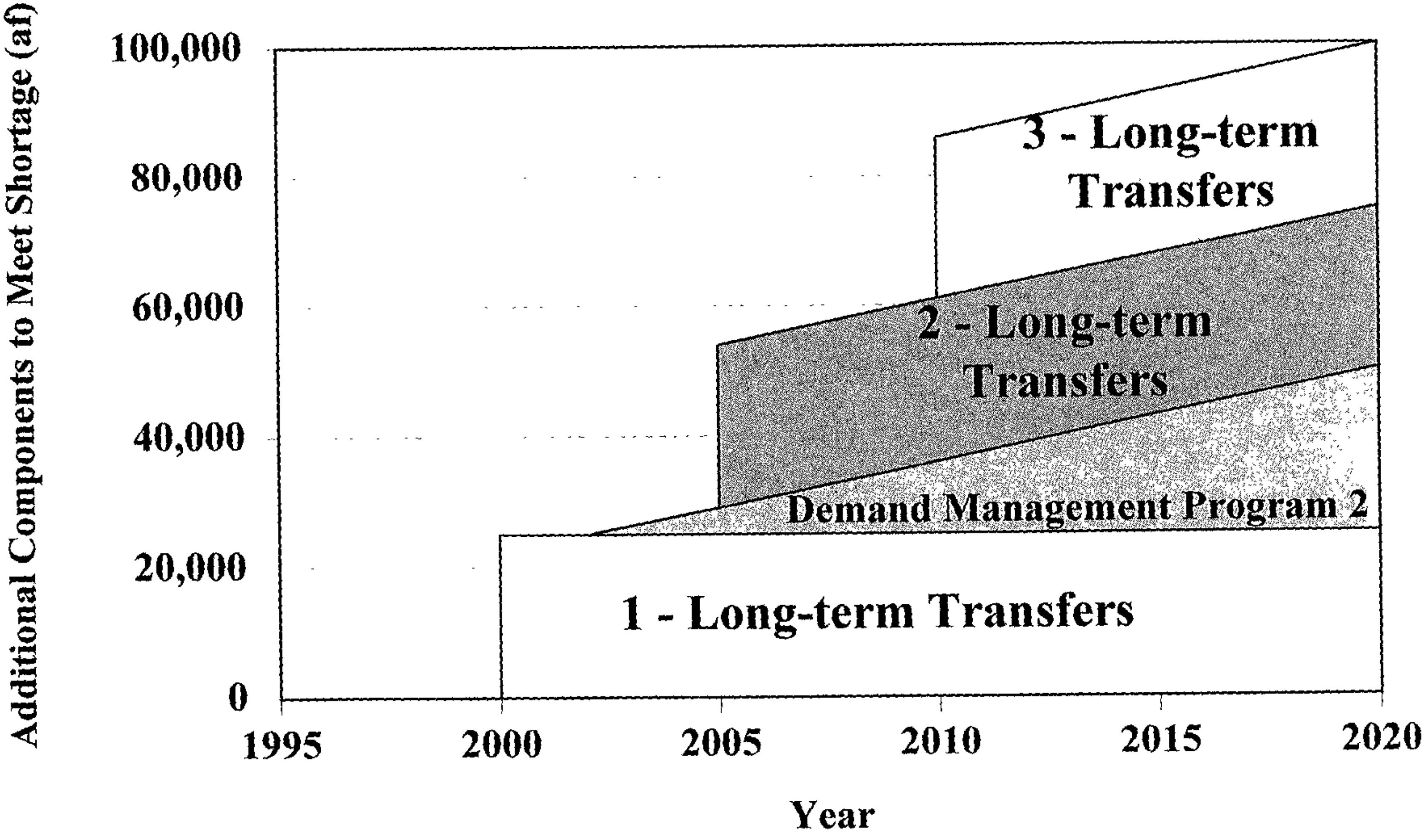
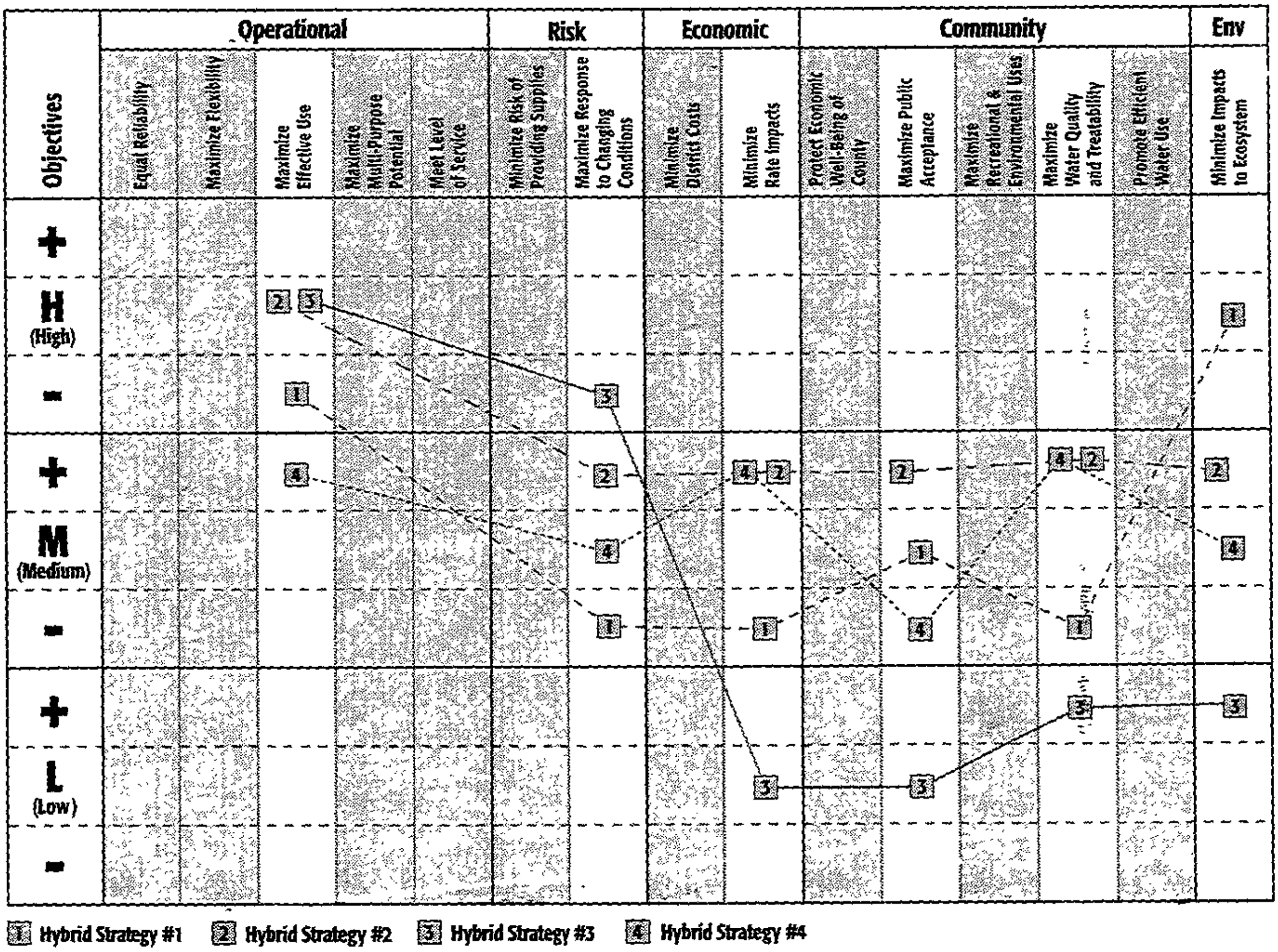


FIGURE 9-5
Evaluation of the Hybrid Strategies



Chapter 10
IWRP PREFERRED STRATEGY

The IWRP preferred strategy satisfies a key objective: to meet the projected demand for future water needs in Santa Clara County while incorporating community input. The strategy maintains a focus on water supply while identifying related issues such as partnerships on water recycling and other components, community costs, growth, and regional approaches to planning.

The strategy outlines three actions programs: minimum, intermediate, and maximum which correspond to a range of future shortage levels. The District will pursue the intermediate action program until such time as projected supply or demand conditions change and make one of the other programs more appropriate.

At the conclusion of their final meeting on November 14, 1996, Level 1 stakeholders endorsed the preferred strategy, predicated on several factors:

- That the District work jointly with wastewater agencies to ensure District water reliability programs and wastewater agency disposal programs are more closely aligned.
- That the District enhance the preferred strategy's core elements to include analysis of the distribution, costs and benefits associated with recycled water throughout Santa Clara County.
- That the District maintain a focus on protecting the economic well-being of the community, in part by developing and implementing programs in a cost-effective manner.
- That the District take a regional approach to solving problems, including growth issues.

Upon staff's recommendations at their December 10, 1996 meeting the Board accepted the preferred strategy and staff's recommendation to proceed with implementation of the intermediate action program (see Appendix L).

Description of the Preferred Strategy

The preferred strategy addresses the following forecast: by the year 2020, the County could experience a water supply shortage of 100,000 af based on current supplies, projected growth, and likely dry periods. The preferred strategy meets a critical dry period (CDP) shortage level of up to 100,000 af by following one of three courses of action, and is designed for optimum flexibility to meet changing conditions and demands. This flexibility is achieved through staged review, development, and implementation of components over time.

As shown in Figure 10-1, the preferred strategy allows for a phased implementation based on the inherent uncertainty of future water demands, and reflects the demand range identified in Chapter 5. The three CDP shortage levels (0, 50,000, and 100,000 af) identified in Figure 10-1 correspond to the minimum (400,000 af) intermediate (450,000 af), and maximum (500,000 af) portions of the demand range. Figure 10-2 shows how the preferred strategy would meet projected future demands given historic water supplies and the maximum demand of 500,000 af.

The intermediate action program was recommended by staff and will provide for a water supply shortfall of 50,000 af or a water demand of 450,000 af but not the maximum projected demand of 500,000 af. As part of the preferred strategy, staff recommends periodic updates (every 3 to 5 years) of the IWRP process to determine the accuracy of water demand projections and the reliability of existing baseline supplies.

The Intermediate Action Program

The intermediate action program of the preferred strategy combines the core elements (see sidebar), water banking, recycled water, demand management, and long-term transfers as follows:

- **Core Elements.** These elements are activities which will 1) ensure the validity of the baseline assumptions; 2) monitor or evaluate resource options; or 3) help meet certain planning objectives.
- **Water Banking.** Securing one or more water banking agreements is the first step in the preferred strategy. These agreement(s) would provide for storage of up to 100,000 af of the District's existing imported water supplies in wet and normal years for use within Santa Clara County in critical dry years. Because of take

IWRP CORE ELEMENTS

I. Actions to Ensure Validity of Baseline Assumptions
- *Achieving 46,000 af/yr conservation.*
- *Achieving 14,400 af/yr non-potable recycling.*
- *Establishing an M&I shortage policy for CVP supplies.*
- *Protecting reliability of SWP, CVP, and Hetch-Hetchy supplies.*
- *Protecting existing resources and monitoring potential impacts.*
- *Implementing programs to seek improvements in source water quality, protect quality of existing resources, and improve treatment capability.*
- *Improving data collection and evaluation.*
- *Expanding and upgrading Rinconada Water Treatment Plant from 80 to 100 mgd to meet anticipated capacity requirements.*
- *Adding recharge or treatment capacity for South County.*

II. Actions to Monitor and Evaluate Resource Options
- *Investigating water marketing opportunities.*
- *Investigating future storage options.*
- *Investigating increased recycling opportunities and the distribution of costs and benefits.*
- *Investigating opportunities to improve the reliability of imported water supplies.*
- *Investigating other resource options that have been held for future consideration.*

III. Actions to Help Meet Objectives
- *Assessing system vulnerability.*
- *Continuing public interaction.*
- *Investigating system re-operation to improve efficiency.*

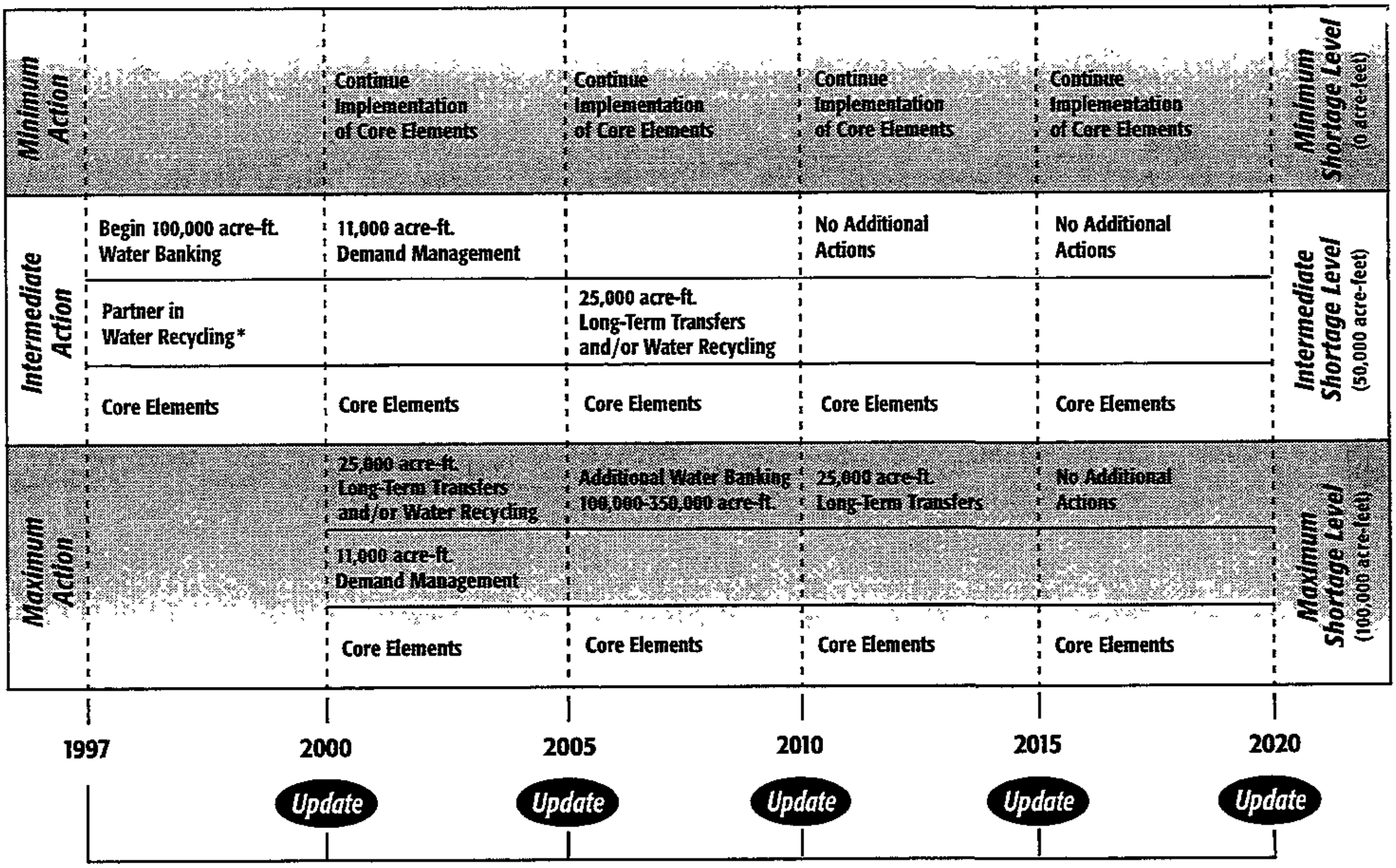
restrictions only 15,000 af/year can be drawn from storage during a CDP. The optimum level of participation in specific water banking programs will depend upon the program's storage and withdrawal parameters and other factors, such as opportunities to cost-share with regional partners. As demands continue to increase, additional storage of up to 250,000 af may become appropriate, and steps would be taken to preserve or develop opportunities for future District participation in water banking programs.

- **Recycled Water**. The preferred strategy calls for an expansion of ongoing efforts by the District and local wastewater agencies to distribute non-potable recycled water for urban irrigation, agricultural irrigation, and industrial reuse. Approximately 2,000 af/year would be developed through an expansion of the South Bay Recycling Program, and the Gilroy/Morgan Hill project would be extended into Morgan Hill for another 4,000 af/year. The strategy also calls for the District to identify opportunities to support and extend these projects during the next 3 to 5 years. Specifically, the District should continue to investigate the potential for cooperative programs with local wastewater agencies. These programs could ultimately replace up to 25,000 af/year of long-term water transfers in the preferred strategy.

- **Demand Management**. The preferred strategy includes Program 1, a voluntary conservation program expected to reduce demand by an additional 11,000 af/year above the baseline by the year 2020. This demand management program would enhance the District's ongoing residential landscape and commercial and industrial incentives, adding more commercial and industrial audits, encouraging the use of low-flow dishwasher retrofits, and requiring water-efficient landscapes for new construction. The preferred strategy calls for implementation of this component to begin after the 2002 sunset of the Water Conservation Best Management Practices MOU. This will allow for evaluation of the impacts of existing programs implemented under the MOU.

- **Long-Term Transfers**. The District would contract with one or more parties to purchase long-term water transfers of up to 25,000 af/year. Contracts for either dry-year options or entitlement transfers would be considered. If future projections indicate that demands will exceed the 450,000 af demand range, additional long-term transfers of up to an additional 25,000 af/year may be appropriate. It is understood, however, that opportunities to secure agreements may arise earlier, and that they will be

FIGURE 10-1
IWRP Preferred Strategy



	1997	2000	2005	2010	2015	2020
Minimum Action		Continue Implementation of Core Elements	Continue Implementation of Core Elements	Continue Implementation of Core Elements	Continue Implementation of Core Elements	*Minimum Shortage Level* (0 acre-feet)
Intermediate Action	Begin 100,000 acre-ft. Water Banking	11,000 acre-ft. Demand Management		No Additional Actions	No Additional Actions	*Intermediate Shortage Level* (50,000 acre-feet)
	Partner in Water Recycling*		25,000 acre-ft. Long-Term Transfers and/or Water Recycling			
	Core Elements	Core Elements	Core Elements	Core Elements	Core Elements	
Maximum Action		25,000 acre-ft. Long-Term Transfers and/or Water Recycling	Additional Water Banking 100,000-350,000 acre-ft.	25,000 acre-ft. Long-Term Transfers	No Additional Actions	*Maximum Shortage Level* (100,000 acre-feet)
		11,000 acre-ft. Demand Management				
		Core Elements	Core Elements	Core Elements	Core Elements	
		Update	Update	Update	Update	Update

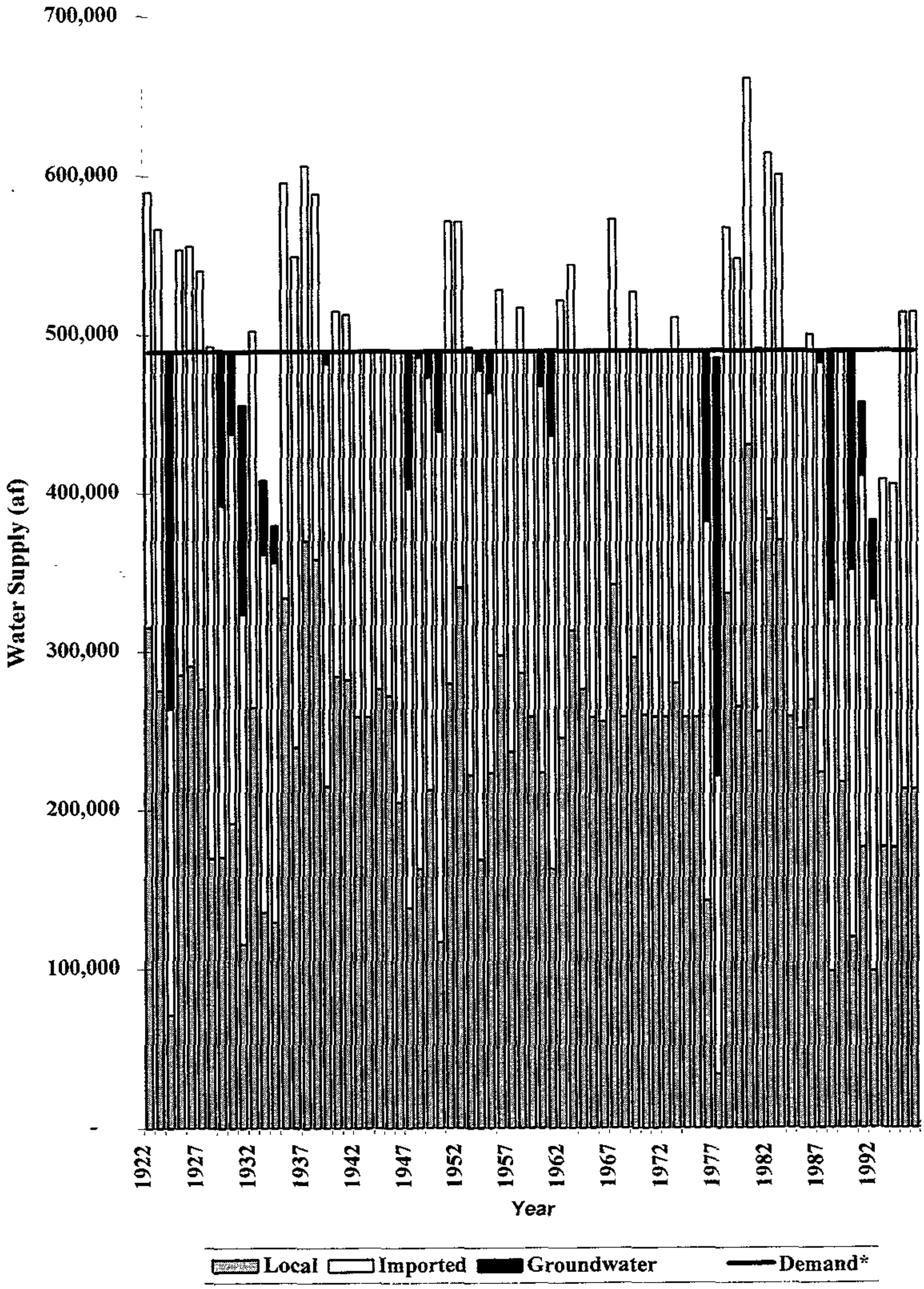
*Minimum of 6,000 acre-ft from infill; additional recycling potential to be pursued jointly with wastewater agencies.

considered. Water recycling could also substitute for water transfers if issues of cost and operations can be resolved. Water for transfers can be made available in several ways, including water conservation and land fallowing by other parties.

Short-Term Implementation of the Intermediate Action Program

Because of the County's current water supply status, staff recommends implementation of only those elements contained in the preferred strategy's intermediate action program, as shown in Figure 10-1. Over time, as additional water demand updates are performed, or as water supplies change, the preferred strategy could shift to either the minimum-action or maximum-action programs.

FIGURE 10-2
Water Supply Impact of Preferred Strategy
Based on Historic Supply Data



* Note: Demand reflects 11,000 af reduction due to Demand-Side Management Program 1

Over the next 3 to 5 years, the intermediate action program of the preferred strategy calls for the District to:

1. Enter into one or more water banking agreements totaling 100,000 af of storage.
2. Work with local wastewater agencies to achieve at least an additional 6,000 af/yr of non-potable recycling through infill of existing projects, and to continue to investigate opportunities for partnering in the development of water recycling with local wastewater agencies to address the region's wastewater discharge challenges.
3. Implement core actions necessary to ensure the County's baseline water supplies.

Evaluation of the Preferred Strategy

As the IWRP process developed, staff and stakeholders observed that six of the 15 planning objectives offered the best differentiation between the hybrid strategies that were used to build the preferred strategy. (See Figure 10-3.) The remaining objectives were either used in strategy design or will be considered in the evaluation and implementation phase of the IWRP. Below is a discussion of how the preferred strategy rated against the six primary objectives, as compared with the hybrid strategies.

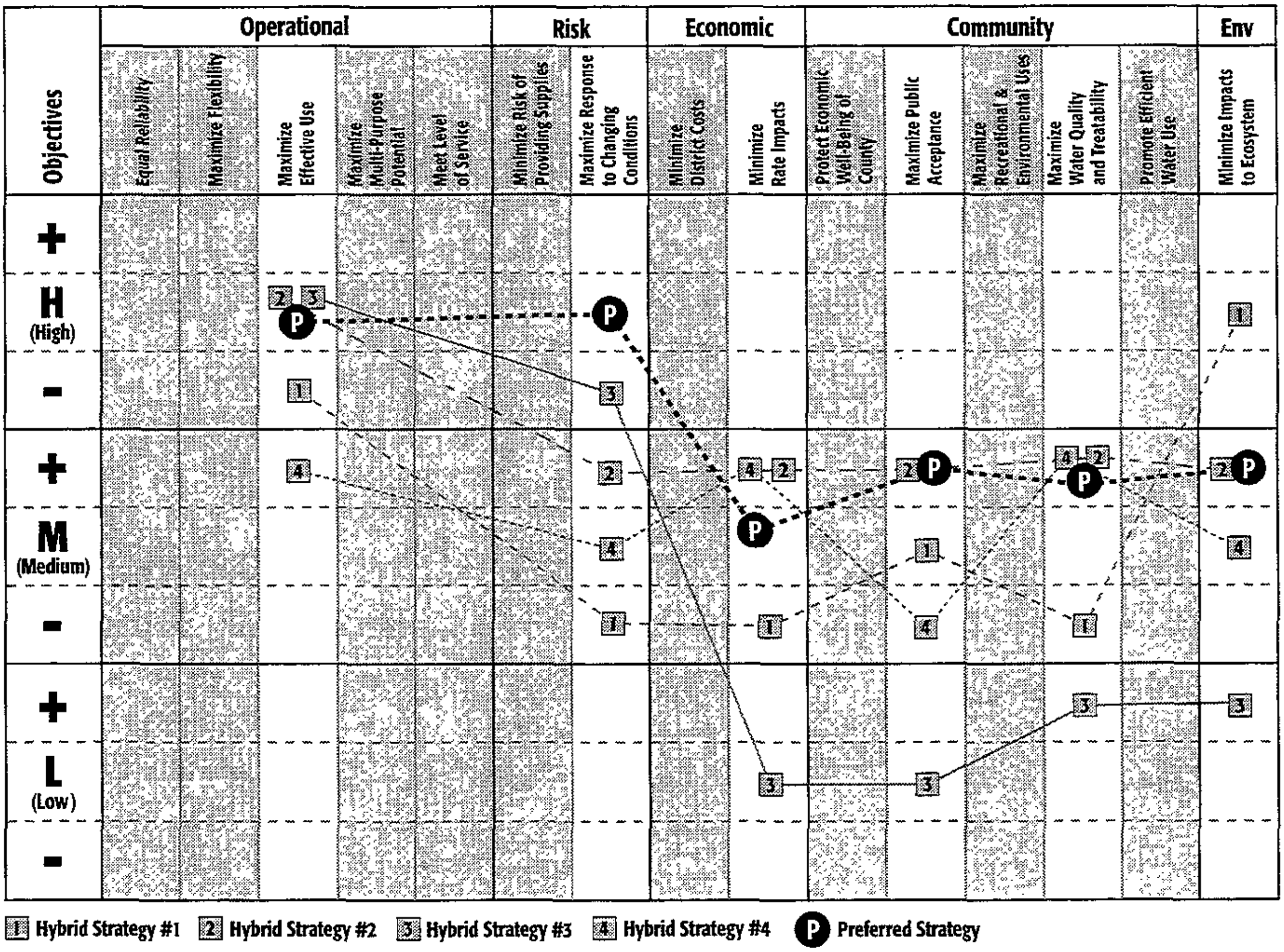
Hybrid Strategies
The preferred strategy was constructed from the most promising elements of four "hybrid" strategies. These hybrids were developed to meet identified objectives, as follows:

- *Hybrid Strategy 1: Minimize Environmental Impacts*
- *Hybrid Strategy 2: Maximize Flexibility to Meet Changing Demands*
- *Hybrid Strategy 3: Maximize Local Reliability*
- *Hybrid Strategy 4: Minimize Costs*

To see how these strategies were rated by stakeholders and staff, and to compare ratings with the preferred strategy, see Figure 10-3.

- **Maximize Effective Use**. The preferred strategy rated high for "Maximize Effective Use" because the banking program would store a large quantity of the District's existing water entitlement that currently is neither delivered to customers, put into existing surface storage, nor recharged into the County's groundwater basin.
- **Maximize Ability to Respond to Changing Conditions**. The preferred strategy rated high, and better than the hybrid strategies against the "Maximize Responsiveness to Changing Conditions" objective, due to the strategy's multiple components. The components are initially implemented with conservative yields that can be increased at a later time as circumstances require. The diversification of components and flexibility in yields for each component results in optimal responsiveness. Consideration has been taken not to oversize components so as to avoid financially impacting the District in the event that expected demand does not materialize.
- **Minimize Rate Impacts**. The preferred strategy ranked medium, and slightly lower than two of the hybrid strategies in the "Minimize Rate Impacts" category, due to the

FIGURE 10-3
Evaluation of the Preferred Strategy



inclusion of non-potable recycling, which raises the cost approximately 15 percent over hybrid strategy 2. However,significant benefits are also associated with the preferred strategy, primarily the reduction of risk.

- **Maximize Public Acceptance.** The preferred strategy ranks medium-plus, consistent with hybrid strategy 2, because of the lower cost to the consumer and also the additional voluntary conservation measures used.
- **Maximize Quality and Treatability of Source Water.** The preferred strategy ranks medium-plus, consistent with hybrid strategy 2 because the source water is the same as currently exists.
- **Avoid or Minimize Adverse Impacts to Habitat or Ecosystems.** The preferred strategy ranks medium-plus, consistent with hybrid strategy 2, but lower than hybrid strategy 1, due to the preferred strategy's lower quantities of conservation and recycled water. Higher levels of conservation and recycled water would result in fewer potential impacts to habitat and would reduce wastewater outflows to the Bay.

The preferred strategy rated better than or equal to the four hybrid strategies, except in the economic and environmental categories. In the event that the preferred strategy evolves to substitute recycled water for the 25,000 af of long-term transfer water, scores would likely be modified for at least three of the six objectives.

In the event that the preferred strategy evolves to substitute recycled water for the 25,000 af of long-term transfer water (as shown in Figure 10-1), scores would likely be modified for at least three of the six objectives, including:

- **Minimize Rate Impacts.** Recycled water is inherently more costly than transfer water; therefore, it is likely that the evaluation would be reduced to medium-minus or lower. However, several factors make economic projections difficult at this time. Negotiation of a cost-sharing agreement between the District and any recycled water provider could result in costs closely aligned with that of a long-term water transfer, depending on the implementation and phasing for each. Both components include some risk due to negotiations that would be required with outside agencies.
- **Maximize Public Acceptance.** The inclusion of potable recycled water rather than additional non-potable water could cause scores to move down slightly. Level 2 and 3 stakeholders have been hesitant to fully embrace the implementation of potable water recycling through indirect potable reuse; however, stakeholders also indicated that a vigorous community outreach program on this issue could strongly improve public acceptance.

- **Minimize Impacts to Ecosystem**. The inclusion of greater quantities of non-potable recycled water in the preferred strategy would likely increase this score, due to the component's reduction of outflows to the Bay and minimal impacts to habitat. Should indirect potable recycling be chosen as an option, the disposal of heavy metals associated with reverse osmosis treatment could potentially reduce scores for this objective. However, such disposal could likely be performed with minimal impacts.

Costs of the Preferred Strategy

The estimated costs of the preferred strategy from 1997 to 2020 are contained in Table 10-1. The first column shows the cumulative costs in terms of 1996 dollars; that is, no inflation is assumed, and the time value of expenditures is not included. The "Present Value" column shows the same expenditures assuming annual inflation of 5 percent and discounting expenditures in future years at 8 percent annually. The present value shows the investment required in 1996 to fund the capital and operating expenditures required through 2020 by the strategy.

TABLE 10-1
Costs of Preferred Strategy and Hybrid Strategies

Strategy	Cumulative Costs From 1997 to 2020 (millions of 1996 dollars)	Present Value (1996 costs escalated at 5 percent and discounted at 8 percent [millions of dollars])
Preferred Strategy	373	213
1. Minimize Environmental Impacts	1,153	624
2. Maximize Flexibility	317	186
3. Maximize Local Reliability	1,017	568
4. Minimize Costs	242	51

As shown in Table 10-1, the preferred strategy is estimated to require outlays totaling $373 million (in 1996 dollars) between 1997 and 2020 for capital, operating, and community costs. In comparison, estimated outlays are $1,153 million for hybrid strategy 1; $317 million for hybrid strategy 2; $1,017 for hybrid strategy 3; and $242 million for hybrid strategy 4. The preferred strategy includes community costs of $45 million for expenditures by water customers to purchase water-conserving appliances and equipment.

TABLE 10-2
Projected Costs of Preferred Strategy by Component
Cumulative Costs From 1997 to 2020

Component	1996 Dollars (millions)	Present Value (1996 costs escalated at 5 percent and discounted at 8 percent [millions of dollars])
Demand Management	14	9
Banking	133	67
Long-Term Transfers	90	56
Non-Potable Recycling	91	51
District Costs[1]	328	183
Community Costs	45	30
Total	373	213

[1] District costs may be reduced through cost sharing with other agencies.

Details of costs by component are shown in Table 10-2. Projected costs for non-potable recycling show the total cost for the infill projects and do not assume any cost sharing with the treatment plant producing the recycled water. The District expects that a cost-sharing agreement will be made with wastewater treatment plants to reduce the District's costs under the preferred strategy. While the total cost would remain $373 million, the share not borne by the District would be added to the Community cost line and recovered through sewer charges.

Under current District policy, all water supply facilities contribute to the common benefit of the community, and the costs are shared among all customers. Thus, the costs of additional supplies provided by the preferred strategy would be pooled with costs of current District supplies to project future revenue requirements. Level 1 stakeholders urged the District to review the practice of pooling for future implementation of preferred strategy elements. The impact of pooling water supply and wastewater treatment costs will therefore be explored during the IWRP's implementation phase to assess cost-sharing implications.

The impact on the District's annual revenue requirements was estimated for the years 2000, 2010, and 2020, and the resulting costs were assumed to be passed on to retail water customers. The results are summarized in Table 10-3. To meet the intermediate shortage level, the District's revenue requirements per af are estimated to increase by 6 percent in 2000, 12 percent in 2010, and 10 percent in 2020. The resulting impacts at the retail level are projected to increase monthly retail bills by 3 percent in 2000, 6 percent in 2010, and 5 percent in 2020.

Assuming the maximum action described in Figure 10-1 is pursued, retail bills are projected to increase 3 percent in 2000, 8 percent in 2010, and 8 percent in 2020. If the District were to share the costs of the preferred strategy's non-potable recycling component with the wastewater treatment plants, the District's costs to implement the preferred strategy would be reduced. A 50-50 split would lower the impact on the District's average revenue required per af in 2020 by $5.

At the retail level, cost sharing is projected to lower the impact on monthly retail bills by one percentage point. Thus, in 2020, monthly retail bills would increase by 4 percent for the intermediate action (compared to 5 percent as shown in Table 10-3) and 7 percent for the maximum action (compared to 8 percent in the table).

TABLE 10-3
Projected Impacts of Preferred Strategy on Monthly Retail Bills in Santa Clara County

	2000	2010	2020
Retail Bills-No action (1996 dollars per month)	$25.00	$25.50	$25.75
Intermediate Action			
Projected Monthly Bill	$25.75	$27.00	$27.00
Percent Increase	3%	6%	5%
Maximum Action			
Projected Monthly Bill	$25.75	$27.50	$27.75
Percent Increase	3%	8%	8%

Chapter 11

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

This chapter describes the steps involved in implementing the intermediate action program of the preferred strategy, including ensuring validity of baseline conditions and implementing strategy components. It clarifies events or circumstances which could affect performance of the intermediate action program and includes and recommends potential actions that could be used to adjust the preferred strategy accordingly.

Recommendations for areas of future work include: integrating the preferred strategy with other District projects; studying key areas further to support and facilitate implementation; addressing outstanding policy issues; revisiting the IWRP process, and generating continued public involvement. This section also includes a brief explanation of environmental reporting requirements.

Implementation of the Intermediate Action Program of the Preferred Strategy

The preferred strategy provides a framework for making water supply decisions over the next several years. Implementation of the preferred strategy is expected to occur over time, as opportunities and needs present themselves.

The next phase of the IWRP process should include the development of a detailed 3- to 5-year implementation plan which describes the activities, schedule and budget necessary to fully implement the intermediate action program of the preferred strategy. Areas to be covered in the implementation plan include the following:

- Activities necessary to ensure the validity of the baseline conditions.
- A budget and schedule for implementing the individual components within the intermediate action program.
- Initiation of work necessary to ensure the availability of strategy contingencies.
- Environmental documentation necessary for implementation.

- Monitoring and evaluation of resource options.
- Activities necessary to meet IWRP objectives.
- Expansion of the public outreach and participation plan.

Ensuring the Validity of the Baseline Conditions

The strength of the preferred strategy rests largely on its ability to meet future needs given certain baseline conditions. Therefore, it is essential that the District confirm the validity of the baseline assumptions. These assumptions are incorporated in the core elements and include the following:

- Achieving 46,000 af/year conservation.
- Achieving 14,400 af/year non-potable recycling.
- Establishing an M&I shortage policy for CVP supplies.
- Protecting the reliability of SWP, CVP, and Hetch-Hetchy supplies.
- Protecting existing resources and monitoring potential impacts.
- Implementing programs to seek improvements in source water quality, protect quality of existing resources, and improve treatment capability.
- Improving data collection and evaluation.
- Expanding and upgrading Rinconada Water Treatment Plant from 80 to 100 mgd to meet anticipated capacity requirements.
- Adding recharge or treatment capacity for South County.

Implementing Components of the Preferred Strategy

Implementation of the intermediate action program of the preferred strategy can begin immediately. Initial steps should include 1) securing agreements for up to 100,000 af of water banking; 2) working with local wastewater agencies to achieve 6,000 af/year of non-potable water recycling through infill of existing projects and investigating the potential for additional recycling through cooperative projects with local wastewater agencies; and 3) implementing core elements.

As has been previously stated, the preferred strategy is intended to be a flexible and responsive solution to the future water supply needs of the County. As a result, it will allow the District to remain open to opportunities that are not currently components of the preferred strategy, but which will function within its overall framework.

Contingency Triggers and Actions

The preferred strategy must be adaptable to future uncertainties, such as changes in water demands, changes in water supply availability, increased environmental concerns and potential demands for water, expanding water conservation efforts, increased costs for developing new supplies, changing water quality regulations, political and institutional constraints, and changing public perceptions about the role of water supply agencies. These uncertainties require that the District continuously monitor, evaluate and modify the preferred strategy.

The District has identified several events or circumstances that could affect the performance of the preferred strategy ("contingency triggers") and several actions that could be implemented to adjust the preferred strategy accordingly ("contingency actions"), as described below.

Contingency Triggers

Contingency triggers include future events that could have a significant impact on either the baseline conditions or on the District's ability to execute the preferred strategy. While some triggers may be slow to develop (and can therefore be addressed during regular IWRP updates), others, such as joint ventures or partnerships, may occur quickly as opportunities present themselves. Potential contingency triggers include, but are not limited to, the following:

- **Identification of a CALFED Solution**. The CALFED process may produce significant changes in how and when water is moved through the San Francisco Bay-Delta. These changes may affect imported water deliveries from both the State Water Project and Central Valley Project in terms of quantity and quality. Deliveries from Hetch Hetchy could also be impacted by a CALFED solution. In addition, elements of a CALFED solution are likely to include new opportunities for water transfers and surface storage which would need to be evaluated within the IWRP framework. Further detail on CALFED and the outlook for imported water supplies is contained in Appendix I.

CALFED is a joint state/federal effort to find solutions to the problems facing the San Francisco Bay/Delta.

- **Failure of a Component to Perform as Expected.** In the event that a component of the preferred strategy does not provide the critical-dry-period yield anticipated in the time frame desired, other components could be evaluated and selected as replacements. Examples would include failure to achieve a prescribed level of demand management, or failure to secure sufficient long-term water transfer agreements to execute the preferred strategy.
- **Unexpected Changes in Water Demands.** Unexpected changes in water demands would represent a significant alteration to baseline conditions. In the event that water demands are either significantly higher (or lower) than those forecasted, a re-evaluation of the IWRP would be required to identify the appropriate contingency action.
- **Exceeding Expectations.** The opposite of a failure to perform. An example of this trigger would include achieving greater levels of demand reductions than anticipated. Under this circumstance, the baseline condition would actually be better than currently forecast, and as a result the District would not need to fully implement the preferred strategy.
- **Joint Ventures.** Potential partnerships with other agencies could change the performance of certain components under the IWRP planning objectives. Such partnerships could include joint ventures with local wastewater utilities on either non-potable or indirect potable recycling, or development of surface water storage options. Remaining open to such opportunities is a core element. Identification of a joint venture opportunity could trigger either a re-evaluation or a modification of the preferred strategy.
- **Emerging Technologies.** The District should continuously monitor changes in technologies that could make feasible water supply options currently held for future consideration.

An immediate potential trigger is a possible joint venture between the District and the South Bay Recycling Program. The RWQCB has directed the City of San Jose and other agencies tributary to the San Jose/Santa Clara Water Pollution Control Board to develop a plan by June 1997 for reducing discharge levels to the Bay.

The District has offered to work with the City of San Jose and other recycling program member agencies to promote additional water recycling to reduce discharge levels. This potential partnership may result in greater levels of water recycling than the additional 6,000 af/year initially anticipated in the preferred strategy.

Contingency Actions

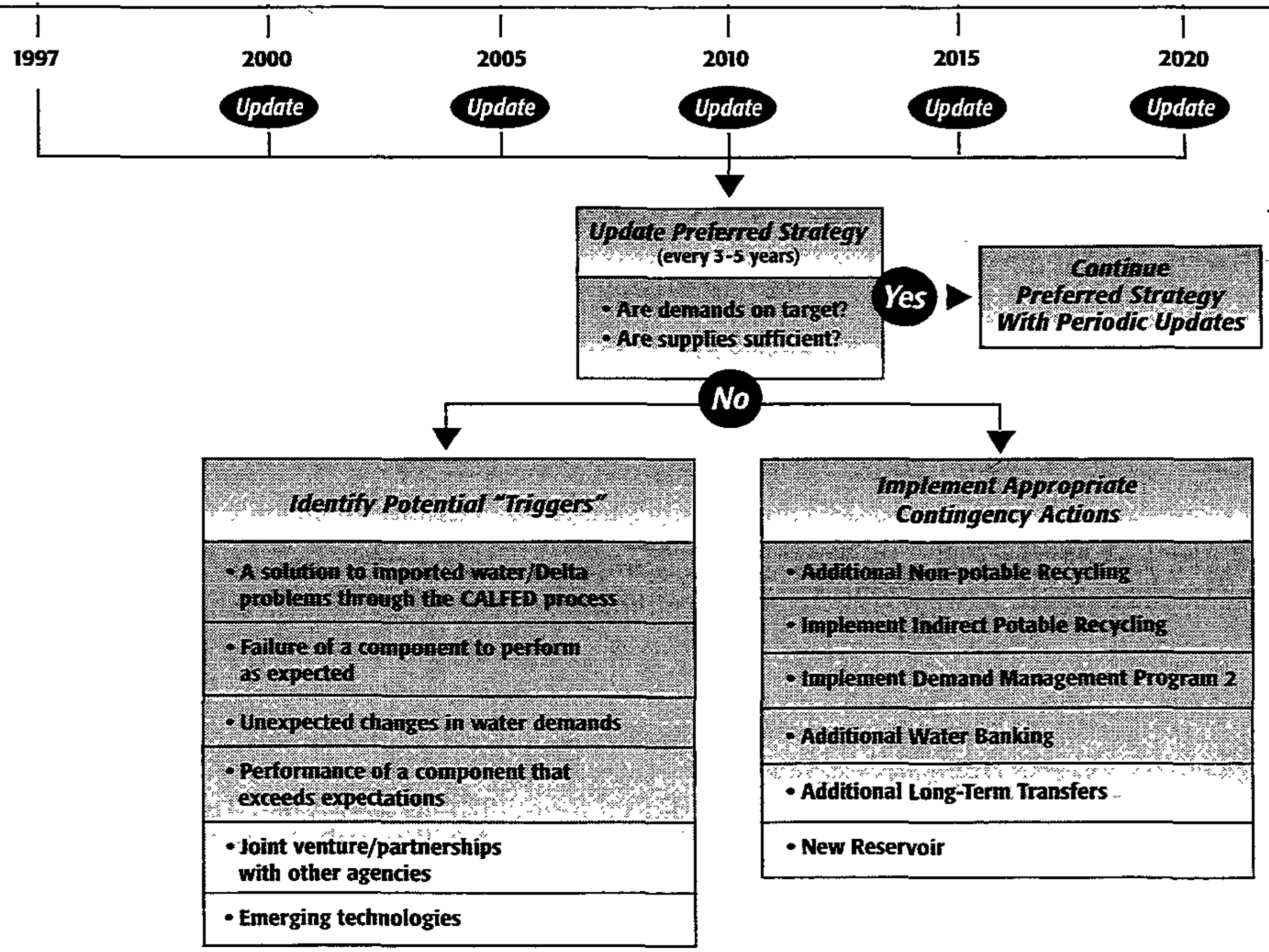
In the event that one or more of the above triggers occur, the District will select from the following menu of contingency actions:

- **Demand Management Program 2.** This program could be utilized to supplement the preferred strategy in the event that water demands increase beyond the baseline projections, or if one or more supply components fail to perform. This program has a 5- to 10-year implementation timeline, so constant evaluation of the baseline would be necessary for timely implementation. It should be noted that this program includes mandatory elements that may encounter community resistance.

- **Additional Non-Potable Recycling**. This component could be used to supplement the preferred strategy in the event that baseline conditions change, demand management programs do not meet expected targets, or joint ventures are undertaken. This contingency action has a 5- to 10-year implementation time line, so constant evaluation of the baseline and additional dialogue with local wastewater agencies would be required.
- **Indirect Potable Recycling**. This component could be used to supplement either supply- or demand-management components in the preferred strategy. Further investigation of this contingency is required as it is relatively new and untested. Because this component has an implementation timeline of 8 to 12 years, investigation into its feasibility would need to occur early in the study period.
- **Additional Surface Storage (new reservoir either in or out of County)**. This component could be used to supplement the preferred strategy in response to unexpected changes in water demands, in the event that another component fails to perform, or in the event that opportunities arise (either in or out of the CALFED process) that would require a re-evaluation of the IWRP. This component has a long timeline (15 to 30 years) and requires careful monitoring of the baseline and ongoing investigation of component feasibility for timely implementation.
- **Additional Water Banking**. This component could be used to supplement the preferred strategy in response to unexpected changes in water demands, or in response to institutional changes brought about by the CALFED process. This component has a short implementation time line (5 years), and could be used on an interim basis while other components with longer implementation timelines are being put in place.

FIGURE 11-1
Preferred Strategy and Contingency Actions

Minimum Action		Continue Implementation of Core Elements	Continue Implementation of Core Elements	Continue Implementation of Core Elements	Continue Implementation of Core Elements	Minimum Shortage Level (0 acre-feet)
Intermediate Action	Begin 100,000 acre-ft. Water Banking	11,000 acre-ft. Demand Management		No Additional Actions	No Additional Actions	Intermediate Shortage Level (50,000 acre-feet)
	Partner in Water Recycling*		25,000 acre-ft. Long-Term Transfers and/or Water Recycling			
	Core Elements	Core Elements	Core Elements	Core Elements	Core Elements	
Maximum Action		25,000 acre-ft. Long-Term Transfers and/or Water Recycling	Additional Water Banking 100,000-350,000 acre-ft.	25,000 acre-ft. Long-Term Transfers	No Additional Actions	Maximum Shortage Level (100,000 acre-feet)
		11,000 acre-ft. Demand Management				
		Core Elements	Core Elements	Core Elements	Core Elements	
	1997	2000	2005	2010	2015	2020


1997
2000
2005
2010
2015
2020
Update
Update
Update
Update
Update
Update Preferred Strategy
(every 3-5 years)
• Are demands on target?
• Are supplies sufficient?
Yes
Continue Preferred Strategy With Periodic Updates
No
Identify Potential "Triggers"
• A solution to imported water/Delta problems through the CALFED process
• Failure of a component to perform as expected
• Unexpected changes in water demands
• Performance of a component that exceeds expectations
• Joint venture/partnerships with other agencies
• Emerging technologies
Implement Appropriate Contingency Actions
• Additional Non-potable Recycling
• Implement Indirect Potable Recycling
• Implement Demand Management Program 2
• Additional Water Banking
• Additional Long-Term Transfers
• New Reservoir

*Minimum of 6,000 acre-ft from infill; additional recycling potential to be pursued jointly with wastewater agencies.

- **Additional Long-Term Water Transfers.** Additional transfers could be used to supplement the preferred strategy in response to changes in water demands, failure of another component to perform as expected, or as a response to institutional changes brought about by the CALFED process. This component has a short implementation timeline (1 to 5 years) and could be implemented on an interim basis or in combination with water banking or surface storage.
- **Additional Short-Term Water Transfers.** This component could be used to supplement the preferred strategy in response to changes in water demand, in the event that other supply components fail to perform, or if a dry period is more severe than anticipated. Additional short-term transfers might also be purchased during times of excess supply and banked for later use. This component has a short implementation time frame and could be implemented on an interim basis or in combination with a storage option.

The contingency actions for the preferred strategy are illustrated in Figure 11-1.

Integration With Other District Projects

Because other District projects influence or may be influenced by the preferred strategy, it is a District goal to integrate IWRP objectives with other high-priority District work. The programs or projects which will affect or be affected by implementation of the IWRP include:

- **Imported Water Project.** Work in this area includes addressing the many complex issues that surround imported water, including legislation affecting imported water supplies; participation in the Bay-Delta CALFED program to address environmental impacts caused by diverting fresh water from the Delta; protection and enhancement of the reliability and quality of SWP and CVP supplies; coordination with District retailers and the City and County of San Francisco in efforts to protect and enhance the reliability of Hetch-Hetchy water deliveries in Santa Clara County; and developing water transfer and banking programs consistent with the District's long-term water supply planning objectives. The District will need to assess the impacts of changes in its imported water supplies and adjust the preferred strategy accordingly.

- **Water Conservation Program**. The District's continuing efforts to promote water conservation through the implementation of Water Conservation Best Management Practices will need to be monitored and measured to ensure that the goals for the program are achieved and are consistent with the preferred strategy.
- **Water Recycling**. The District's efforts to financially support and encourage the development of recycled water will need to continue. Additional efforts to work with local wastewater agencies will also be needed in order to achieve the goals contained in the preferred strategy.
- **Public Education**. Throughout the IWRP stakeholder process stakeholders have raised the concern that the public needs to know more about the complex issues surrounding the delivery of water in Santa Clara County. Stakeholders encouraged the District to expand its current program to increase public awareness of District water supply activities and responsibilities.
- **Watershed Management**. A growing interest in watershed management—by the District and others, including the Regional Water Quality Control Board—offers opportunities to integrate preferred strategy goals with watershed management activities.

These efforts would include improving coordination of District water supply and flood management programs, as well as improving water quality to protect source water and ecosystems in Santa Clara Valley watersheds and the South Bay. The District will need to participate in such efforts in order to promote preferred strategy goals and to ensure that the watershed plan supports and maintains the reliability of the County's water supplies.

Key Areas for Further Study

To support the implementation of core elements, facilitate the implementation of the preferred strategy, and ensure the availability of contingency actions, the District will need to perform the following work over the next 3 to 5 years:

- **Begin feasibility study of indirect potable recycling** to determine the technical and economic feasibility of developing this resource option. Future investigation may also include development of pilot projects.

- **Further investigate storage options** such as a local surface storage facility or a regional storage facility such as Los Banos Grandes. Other investigations might include participation in storage options developed as part of the CALFED process.
- **Develop a Countywide Basin Management Plan** which identifies basin storage potentials, relationships between surface water operation and groundwater, optimization of operations, and policies governing the role of the basin in meeting critical-dry-period demands. Additional work may also include identification of further recharge opportunities and policies or pricing structures to influence pumping within the basins.
- **Develop a Demand Management Master Plan** which contains an implementation schedule, organizational and staffing requirement, and marketing plans for both the Baseline and Program 1 demand management programs. In addition, the plan should evaluate the effectiveness of demand management programs to date and establish baseline conditions for water use patterns, and the penetration of water-conserving technologies and practices within the District's service territory.
- **Update the District's water demand projections** to reflect the most current ABAG data. Water demand projections are an integral element of the IWRP process and future actions are likely to be driven by changes in water supplies and demands as well as by projections of future changes. As a result, the District's shortage projections must be revisited on a regular cycle.
- **Evaluate system vulnerability** to short- and intermediate-term changes to the District's water supplies due to unforeseen events such as earthquakes, chemical spills, facilities outages (including extended outages of imported supplies due to levee failure in the Bay-Delta estuary), and flooding leading to contamination.
- **Evaluate re-operation of current District facilities** to maximize the use of existing local and imported water supplies. This evaluation could include an analysis of District operations, pricing and groundwater policies.
- **Analyze the impacts of cost-sharing additional non-potable recycling** with the South Bay Recycling Program. This work is needed to determine the

distribution of costs, impacts, and community benefits which might occur through a water supply/wastewater partnership.

Outstanding Policy Issues

During the course of the IWRP process, Level 1 and Level 2 stakeholders raised issues that were felt to be outside the scope of the IWRP process, but important to the District nonetheless. These issues included:

- **The District's role in managing the future growth of Santa Clara County**. This issue was raised by the Level 2 public forum participants and further discussed by the Level 1 group. Some stakeholders felt the District should become more proactive in working with local land use planning agencies to convey the impacts of growth on local and statewide water resources. Level 1 stakeholders suggested this issue should be raised with the Water Commission, an advisory committee to the District Board comprised of local elected officials.

- **The District's role in enhancing the local environment through stream flow augmentation and other mechanisms**. Also an issue raised during the Level 2 Public Forum. Some stakeholders felt that the District was perhaps the best-positioned agency within the County to address issues of environmental enhancement.

- **The District's pricing policies and their impacts on water use and markets for non-potable recycling**. This issue, raised by a Level 1 stakeholder, concerns whether current District pricing policies discourage a broader market for non-potable recycling, particularly in the agricultural sector.

- **Equity for efficient water users during periods of drought**. Some Level 1 stakeholders expressed a concern that those who have aggressively pursued efficiency improvements would be asked to further reduce during periods of shortage. Stakeholders felt that efficiency improvements should be accounted for in determining the level of rationing applied during period of drought.

- **The District's role in protecting the economic well-being of the community**. Level 1 stakeholders strongly urged the District to work collaboratively with the South Bay Recycling Program and others on issues impacting the economic well-being of the community. Stakeholders specifically suggested that further discussion and analysis should occur on issues surrounding cost-sharing of water recycling projects.

These issues will be referred to the District's Board of Directors for review and further direction during the IWRP Implementation Phase.

The Need for Environmental Studies

District staff have reviewed the requirements for environmental analysis that pertain to the outcome of the IWRP process and the components of the preferred strategy. Based on this review, staff recommend that an Environmental Impact Report (EIR) is not necessary at this time for the following reasons: 1) the conceptual level of detail associated with the preferred strategy does not constitute a requirement for an EIR under the California Environmental Quality Act (CEQA); 2) the current phasing of some of the components associated with the near-term implementation plan would occur up to 5 or more years in the future and therefore environmental analysis would be premature; and 3) environmental documentation for each of the individual components may either not be required or would be performed as the responsibility of an agency other than the District.

As implementation plans are prepared for the components of the preferred strategy, more details on each component will be developed. When the definition of components reaches a point where their implementation may result in an impact to the environment, three possible scenarios exist for the preparation of environmental documents:

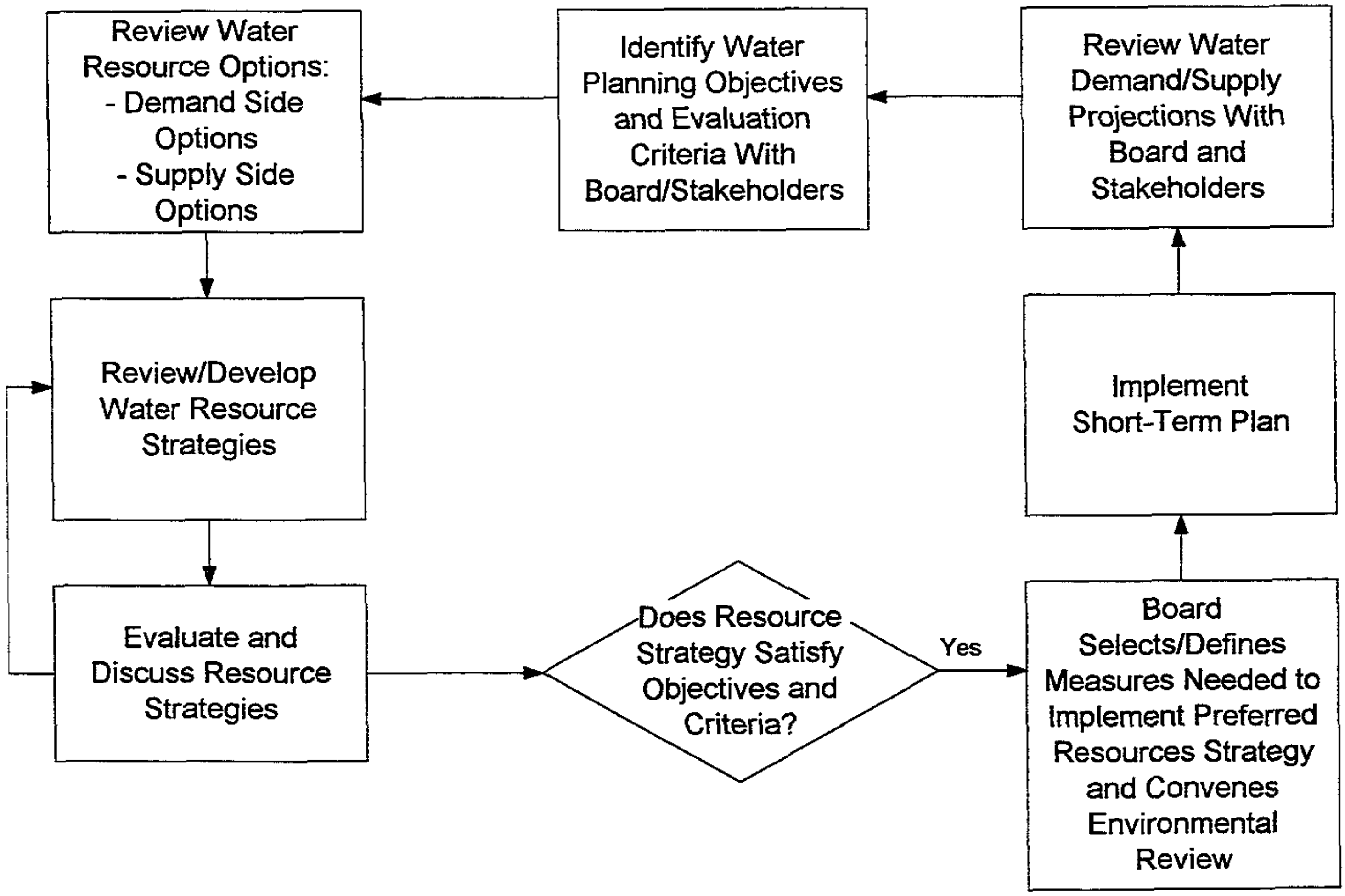
- **Program-Level EIR.** A Program-level EIR could encompass a number of components within the preferred strategy; however, the District may find it difficult to modify the preferred strategy outside of the scope of the original Program EIR. In addition, a Program-level EIR could become outdated, necessitating development of a more detailed Project-level EIR.
- **Project-Level EIR.** A Project-level EIR would be prepared when the Board decides to move forward with each component. This document would be geared to a greater level of detail; thus some of the components as they are now included would require further definition.

- **Combination Project- and Program-Level EIR.** A combination EIR could lend the District a degree of flexibility. The District could proceed with a Project-level EIR while still reserving the option for a Program-level document.

The Ongoing IWRP Process

As the IWRP evolved, both staff and stakeholders concluded that, for optimal performance, the process should continue with ongoing community involvement. Staff have determined that in addition to ongoing monitoring of baseline conditions and contingency triggers, the IWRP planning process should be revisited every 3 to 5 years. Figure 11-2 shows theproposed ongoing IWRP process.

FIGURE 11-2
The Ongoing IWRP Process


Review Water Resource Options:
- Demand Side Options
- Supply Side Options
Identify Water Planning Objectives and Evaluation Criteria With Board/Stakeholders
Review Water Demand/Supply Projections With Board and Stakeholders
Review/Develop Water Resource Strategies
Implement Short-Term Plan
Evaluate and Discuss Resource Strategies
Does Resource Strategy Satisfy Objectives and Criteria?
Yes
Board Selects/Defines Measures Needed to Implement Preferred Resources Strategy and Convenes Environmental Review

A key point, agreed on by most stakeholders, is that continued public outreach is vital in order to achieve community support for actions identified in the preferred strategy. In particular, stakeholders encouraged the District to develop a public outreach program to focus specifically on water recycling—both non-potable and indirect potable.

In response to Level 1 stakeholders' requests, the stakeholder process will be extended to include implementation planning as well as review of contingency actions.

One of the highlights of the IWRP process has been the active involvement of the public. Stakeholder participation has allowed staff to address tough questions about the challenges the District faces and possible solutions to them.

Level 1 stakeholders have indicated that they would like to continue assisting the District as the IWRP process unfolds. Staff envision continuing stakeholder input and public outreach through the implementation phase. Continued public involvement in the ongoing IWRP process will ensure that the District's water supply planning and implementation remain responsive to community priorities and result in a reliable, high-quality water supply through the year 2020.